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The Wild Life Preservation Society of India

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Elephants in conference on the point of breaking up. —*Photo by M. Krishnan*

Wild Life Preservation Society of India

1. The aims and objects of the Society are as follows:—

   (a) To promote interest in and impart knowledge regarding the preservation and conservation of all forms of wild life, particularly among the youth of the country.

   (b) To co-operate with the Govts. of India and States and with other Societies and Institutions having similar aims and objects in working for the interests of wild life.

   (c) To assist in enforcing and actively supporting the Forest Acts, Wild Birds and Animals Protection Acts and Rules etc. of States and the Indian Arms Act and Rules in so far as they pertain to wild life and to bring to the notice of the authorities any infringement of the same and to assist in the detection and prosecution of offenders in respect of such laws.

   (d) To advise and help the Govt. and wild life administrators in the formation, maintenance and protection of Sanctuaries and National Parks, the preservation of wild life in general and rare species of India in particular and in the introduction of exotic species into the country, the rehabilitation of rare species etc. and in the revision on rational lines of the shooting and fishing rules, so as to conserve and increase wild life stocks.

   (e) To raise funds for the carrying out of the above aims and objects and to found and maintain museums, reading rooms and libraries of natural history in order to disseminate knowledge regarding wild life.

   (f) To promote sportsmanship in shikar and to recognise well regulated shooting and fishing, as a means of preserving wild life and fish so that through wise use the surplus may provide a recreational asset to the nation.

   (g) To carry out publicity and propaganda for the preservation of wild life in India by means of monographs, journals, films, film strips and other feasible methods.

   (h) To assist members of the Society in obtaining shooting and fishing facilities and facilities for viewing and photographing wild life in India.

   (i) To conduct research into the problem of Wild Life management in India, and in pursuance of this, to initiate, encourage and, where possible assist in projects for the study of threatened speceis and related subjects and to provide reference and research facilities for such work.

   (j) To carry on such other activities which will serve the above subjects.

What membership of Wild Life Preservation Society of India will entitle you to ?

1. You will become an active member of the growing group of Wild Life enthusiasts, who enjoy working fo and spreading the knowledge of how to conserve India's heritage of Wild Life for posterity.
2. You will be entitled to the full use of the Library of the Wild Life Preservation Society and of its reading room.
3. You will receive a membership certificate.
4. You will receive personal Identification and Membership card.
5. You will be entitled to buy all publications of the Society at a concessional rate.
6. You will been titled to buy at concessional rates the Society's Greeting Cards, Calendars, Tie, Lapel badge and the Balance of Nature Game (specially Published in colour for its educative and recreational value).
7. You will be supplied "Cheetal", the quarterly journal of the Society free.

For membership particulars write to Honorary Secretary, Wild Life Preservation Society of India, 7 Astley Hall, Dehra Dun.

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In Vol. 15, No. 2 of Cheetal, the author of "A Note on the Eravikulam-Rajamallay Sanctuary High Range, Kerala" is Shri Ranjitsinghji, I.A.S., Deputy Secretary in the Ministry of Food & Agriculture, Government of India and his name was not mentioned by mistake for which we are sorry.

—Editors.

Wild Life Preservation Society of India

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Editorial

August 1972 was heralded as a red letter day for wildlife in India. It marked the passing of Wild Life (protection) Bill 1972, by the Parliament. Wild Life enthusiasts (and wild life no doubt) that we now at last, had a National Act for Wild Life Protection—could it not have been "conservation". Eleven States had agreed to the Union Government legislating on wild life, a state subject, and it is learnt that more recently another three states have also delegated this power to the Union Government. No doubt the kudos goes to the Prime Minister whose keen interest in wild life has brought the precarious status of wild life in the country to the notice of the legislators and the public and has overcome the almost insurmountable hurdles of bureaucracy.

The hopes that the passing of the Bill had first engendered, have now been partly belied by the fact that though Parliament has passed the Bill, it has not been enforced as yet and the rules which are to be framed under it have not been finalised. The States have also not finalised the rules which they too are required to frame under the provisions of the Act. The damage that will continue to be done to wild life between the passing of the Act and enforcement of the rules will result in avoidable damage to wild life and its habitat in many areas, particularly where such areas are not under the control of the Forest Department. No doubt, efforts are being made to ensure that the rules being drafted are as comprehensive and legally acceptable as possible but we hope that in the effort to do this their implementation is not unduly delayed.

While it is essential that we should enforce the Act and the rules framed under it, as soon as possible, it is also a pre requisite that the attitudes of the general public particularly those living in and near wild life habitat be changed by a well organised publicity programme, to bring home to them the long term benefits of wild life conservation Without a change in their attitudes, wild life protection would continue to be on the rule books and tigers would still be poisoned, deer shot for the pot under the guise of crop

protection, and skins and meat sold in nearby markets. Among the noteworthy provisions of the new Act is the enhancement of penalties for the contravention of the rules framed under it. Punishment by imprisonment up to two years and a fine extending up to Rs. 2000/- are not too severe for poachers. What is perhaps more important is the provision for minimum punishment for certain offences. This would ensure that persons against whom cases have been painstakingly built up by the protective staff, under difficult and trying conditions are adequately punished and wild life crimes are not treated lightly.

Another important provision is that cases of a certain nature may not be compounded by the protective staff, but must be proscuted in a court of law. The power to compound such offences was an important and useful tool in the hands of the protective staff, for frequently it is not possible to build up a legally tight case against known offenders and it then becomes necessary to take executive action through, "persuade" the alleged accused to agree to compounding the case. It is true that this power has sometimes been misused, but more often, it has proved a most effective tool.

A provision which could be criticised is that every one possessing a trophy must declare it to the chief wild life warden within a prescribed time. Public museums are exempt from this but private clubs and individuals are required to make this declaration which would place a heavy burden on both the owners and the wild life organisation of the Forest Department.

The provision regarding onus of proof lying with the accused has been taken from the Indian Forest Act where it applies chiefly to timber. Though this clause has not always been upheld by the courts, its application to timber is understandable since it is impossible to distinguish between timber cut in the forests or in private holdings, but this is not so with the species of wild life mentioned in the schedules to the Act and it is likely that this provision will not stand when tested in a Court.

A. Oswald

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Self-Sacrificing Colours of Animals

By

M.B. Makki

Is it necessary as is generally assumed that a male among birds and mammals should court and charm its mate with brilliant colours, music and dance, sometimes the one with whom he might have even raised several generations of the young ? Should the male charm the female all its life and several times a day, in or out of breeding season, as it is generally assumed in the case of some, for example peacock and pigeon ? Again do not such brilliant colours make the males conspicuous in their surroundings, while the way of nature is to make them merge in them ? If Nature intended to make the males handsome for pleasing or charming the females, she would have given them colours identical with those of their environment, possessing at the same time different tones and shades to render them attractive. This would have served a double purpose of saving them from their predators and making them handsome enough to charm the females. Highly priced pieces of paintings depict this harmonising of colours. People of taste adopt such matching of colours in their dress. Some ladies, in order to enhance their beauty go so far as to make their apparel match the colours of their ornaments and even the furnishings of their drawing-rooms. Since they are not identical, their purpose must be different. Again brilliant, contrasting colours are jarring to our imagination and so it ought to be to animals, as we transfer man's standpoint of beauty to them. The assumption, therefore, that the object of Nature in giving brilliant and conspicuous colours to males is to make them court and charm the females, hazarding their safety needs to be revised. What the real object might be, has been discussed later in this essay.

Thirdly if we take all the animals of land, air and water, perhaps only one percent and even less possess the embellishments thought to be necessary for charming the female. If courtship had any relation with embellishments and if it were a neccssary factor for reproduction, their number would have been high. As it is only infinitesimal, it goes to prove that embellishments or decorations in animals have a purpose other than courtship.

Julian Huxley defines courtship as "the function to stimulate psychically and bring the female to the condition in which pairing may be accomplished." Perhaps he means by this that the female has to reach a particular state of mind so that conception may be accomplished and this could be achieved through courtship. On the other hand Dr. Salim Ali, the Indian Ornithologist, in his book attributes to courtship not psychical but "physiological response for successful breeding." But veterinary science does not recognise either. Intervention of courtship for the natural process of conception is not countenanced by this Science. Statistics prove that in Government Cattle Breeding Farms all over the

country, where females are forcibly crossed by pedigree males, conception results in almost all the cases. As ths females get generally agitated in the new surroundings of the Breeding Farm they are even tied to wooden stakes on either side to keep them in proper position. The persons in charge only wish to know whether animals are on heat, which is a periodical occurrence not brought about through courtship. In artificial insemnination performed at these stations even the male's presence is dispensed with. Amongst some species of aquatic animals, males and females do not even come together but merely spill their eggs and sperm which later combine. When the very presence of the male is not needed as shown by these cases where is the necessity of courtship ? All this proves that courtship is not a necessary factor for reproduction. So animal courtship is not a fact but dwells only in our imagination.

Coming to the point of the female's choice which is a corollary to courtship, that she selects the one who courts her best or who is most agreeable to her, it may be asked whether a common observer ever sees it. If a fortunate few have seen an act of the female which they interpret as her choice, an occasional act cannot establish a general rule. In fact choice by a female goes against the general way in Nature, for her selection may be arbitrary, guided by the decorations in males. A male may be handsome though not strongest and pairing with him brings forth weak offspring not able to face the struggle for existence. Here Darwin's contention that the strongest is generally the most handsome cannot be borne out by facts, for, it is common knowledge that animals as they grow up whether weak or strong generally attain uniformly the same colours and features common to their race. Again he says that "the females prefer not only the more attractive but also the more vigorous and victorious ones." This means that the female would be watching before her selection who is the vigorous and who the victorious. But the big-game hunters and naturalists whom the writer has met do not say that the female exercises such close scrutiny or any scrutiny at all. A major part of the writer's life (he is now 69) has been spent in the forests and plains of India watching animals and he too has not seen a female distinguishing one male from another. Besides he has witnessed many a fight of deer and antelope males. What he found, on the other hand, was that the rivals would be battling for hours, and the females feeding peacefully nearby would not even lift their heads and see what was going on.

Giving the female a high taste of discovering beautiful colours, elegant and artistic patterns in the body, fur and feathers of males would be assuming too much. Darwin himself doubts it. To quote him, "it is astonishing that females of many birds and some mammals should be endowed with sufficient taste to appreciate the ornaments which we have reason to attribute to sexual selection and it is more astonishing in the case of reptiles, fish and insects, but we really know very little of the mind in lower animals." (Origin of Species). And on this shaky and uncertain ground his theory of Sexual Selection has been

mainly built, that the elegant colours and patterns we find in the body, fur and feathers of the males in certain species have come down to the present day because the females preferred more handsome to the less handsome males and the progeny inherited and improved upon those features. Why is it that in spite of his doubts he stuck to this theory ? The reason must be that he could not think of a possible explanation for these embellishments. An explanation about these decorations has been given by the writer elsewhere. Though the theory of sexual selection has been much changed since Darwin's time yet the original concept of courtship by male and selection by female is still believed in.

Again if the female's choice were a reality, it would have been exercised in as careful a fashion as is required by the meticulous care taken by Nature in giving intricate patterns and well arranged colours to the male. A haphazard casual choice, not thoughtfully used and not used to the same pitch or degree as is required by the elegant ornamentation in male throws it into imbalance and makes us conclude that there is no relation between the two, namely, the ornamentation and the choice. All this makes us conclude that choice by female is not a categorical certainty.

Many of these anomalies are due to transfering to animals our own acts, our feelings and sentiments and our sense of what is beautiful. Whether there is any purposeful presentation of beauty in Nature and whether it is employed to please anyone as it assumed in the case of courtship, requires to be examined. Beauty is an accident in Nature. Objects of the Plant and Animal Kingdom adopt attractive colours and patterns to fulfil some of their ends none of which being related to charming and pleasing, and they incidentally appear beautiful to us in the same way as the vocal sounds uttered by some birds to advertise their territory appear sweet music to us, though the intention of these birds may not be to present music. Again flowers surpass animals in beauty. Do they intend to set it out or to please any one ? Fruits too adopt various colours. Their only purpose is to stand out from their surroundings green vegetation to be visible to insects, birds and beasts who help in their pollination and dispersal of seeds. Similarly animals too wherever necessary adopt colours contrasting from their environment to stand out conspicuously in order to warn their enemies and to be recognised by their fellows and such other purposes. And if they adopt colours identical with their surroundings it is to escape from their predators or to use those colours to approach their own prey. Thus we see in these animals and plants, colours having relation with their physical environment and none are for charming and pleasing anyone. To say that some colours are used as nuptial or display ones.....to present beauty and to charm or please or to give rise to any emotional response as is assumed in

courtship, against what prevails in the whole organic world with regard to coloration, is to speak the improbable.

Now it may be asked if those brilliant colours termed display or nuptial ones (as distinguished from protective, warning, recognition ones etc.), are not meant to be used by the male to charm the female, what are they for ?

The answer is, that the males use these colours to stand out conspicuously in order to draw the eye of the enemy to themselves and away from the lighter coloured females and the young, that is, they try to offer themselves for sacrifice to save their kin. It may be said that this fact has long been recognised and it is not a new thing. In answer to it, it is pointed out that the purpose of such brilliant colours in the past has wrongly been coupled with that of charming of the females. This essay—emphasises the fact that it is meant exclusively for the former and the charming of the female does not come into the picture at all. The second point that is stressed here is, that their attempt at self-sacrifice is more deliberate than hitherto has been recognised. This is the special aspect and the difference from the old belief that has been stressed in this essay. Like the Japanese Kamikaze of the last war, they seek death for the good of their race. An example will prove this fact better. The ruffed grouse has small feathers round its neck in the form of a ruff. This is wrongly believed as an aid to the charming of the female. He stands exposing himself openly in a manner to make himself conspicuous and is slow to escape from danger. He even makes drumming sound with his wings which gives out his position to a hunter or a carnivorous animal lurking nearby. He is therefore called a foolish bird. The laborious attempt of, Mr. Gardiner Bump (in his book "Ruffed Grouse") to make the males act the charming of the female leaves the reader unconvinced. This act is not a disadvantage but an asset to him, for, through this, he has saved his species from extinction. By exposing himself and making sounds, he focuses the attention of the enemy on himself and does not allow him to fall upon the brood and kill several individuals. He might be killed or he might escape, but his act of offering himself for self-sacrifice ensures the safety of the group in his charge. He appears to say to the enemy, "come, kill me, satisfy yourself and go. But do not even look at who are around me." Our own jungle cock, peacock, turkey and some other gallinaceous birds act more or less in the same way. The domestic cock generally beats his wings against his body before crowing, his old habit. The peacock makes vocal sounds and spreads out the tail into a fan to enhance his conspicuosity and would be—continually shaking his wing feathers to attract the enemy's eye, if he approaches from the side or from behind. To go into a little detail with regard to the peacock, the presence of even a sparrow or a crow, sometimes triggers off this activity. Call it habit or a conditioned reflex which springs

involuntarily to make him conspicuous in order to draw the attention of the predator. The members of his group are scattered in the brush, they may be feeding or resting on the ground and a brooding hen might be sitting on eggs in a scooped up hollow on the ground. There is no safety of a tree here. An enemy might approach close to them and under cover of the long grass or small plants might pounce upon them. Commonsense points to the fact that the peacock under such circumstances ought to adopt a device to draw the attention of the enemy from a distance, before it approaches his brood, and so he should stand high above the surrounding scrub and enhance his height by opening up his tail. The feathers are multicoloured to catch the eye better. The throbbing movement of his wing feathers is interpreted as his flying into ecstacy, falling in love with his own beauty or charming his mate to an extreme degree, which all mean, he is more emotional than a human being and that his mate requires this kind of high pitched wooing not only all her life but several times a day. To a keen observer all these are fallacious conclusions. Among animals, movement is necessary to attract the eye of an observer as lack of movement leads to concealment. The intention of the peacock is to draw the eye of the observer and hence the giving of throbbing movement to his tail feathers. The turkey cock beats all others in making himself conspicuous by fluffing up his feathers to increase his size, strutting and uttering sounds at short intervals, almost the whole day. When a rooster is feeding with his head down, his eye-catching comb and wattles are hidden, so, he sends up his long tail feathers above the scrub to point out to an approaching enemy where he actually is.

Against the arboreal birds, the ground birds feed and breed in a comparatively dangerous environment. They are thus an easy prey to the prowling weasel (mongoose), fox, wolf, jackal, wild dog and such other carnivora and the most formidable foe of all, man—primitive man hunted them for thousands of years. Under these conditions, if the males of these ground birds, such as peacock, pheasant, ruffed grouse, jungle cock etc. (who are particularly put forward as examples of charming their mates with the beauty of their feathers) had not adopted such devices, to draw away the attention of the enemy from their brood to themselves and to sacrifice themselves if necessary, their species would have ended long ago. Elliot Howard's theory, however, much it may suit other birds, cannot be applied to the gallinea, for they do not make sounds, perched safely in trees. Standing on the ground and making sounds draws the prowlers to them more than keeping out intruders from their territory.

Now an example of a mammal can be taken up. The male Black buck with its dark velvety coat and 'V' shaped horns stands openly, in a plain, visible to a hunter or a carnivorous animal even from half a mile. The females and the young are earthcoloured and are almost invisible from a distance. The first to be attacked therefore is the buck. While

trotting away from the place, he places himself generally in the rear of the herd. Thus he would be himself nearest to the enemy to draw his attack upon himself. The hunting cheetah reared by the Indian Princes, before the killing of the Black buck was prohibited, pulled down ninety-nine cases out of a hundred, the male only. It was not that the cheetah wanted to observe the game regulations that only the male should be killed, but because it could see none else. It may be noted that in all these cases there is a deliberate attempt at self-sacrifice. The cheetal and sambhar males have high outspread antlers, the mountain sheep and the wild goats have horns disproportionately large compared with their size, some curving on their back and some round their ears. They do not and cannot use their horns in their fights with each other. They butt each other's forehead instead. Nor are they for ornamental purposes to charm the females. The only use of their horns must be to draw the eye of the enemy.

For other proofs, we see males in such mammals and birds standing higher than the females, for it is they who have to offer themselves for sacrifice and so ought to be visible. They add to their height with combs, crests fanned out tail feathers or horns. Their colours too are graded from their feet upwards. Their feet are drab coloured as they are generally hidden from the view of the enemy. The under parts of their body are light coloured. The breast and neck wear the deepest of colours. The head has coloured wattles, combs, or crests, as they all fall in the direct eye level of the particular predators that each of such species have. Above this as in the case of the ostrich, the colours again become drab.

All this shows that the so-called nuptial colours and other ornaments have little connection with their sexual relations, but have one aim, namely, to draw the attention of an enemy. They can be thought of as interspecific rather than intraspecific. Also they should be considered as the result of Natural rather than Sexual selection. Those species with males possessing colours and ornaments meant for sacrificing themselves for their group, had a better chance of survival than those who lacked such males and thus subjected themselves to a surprise and sweeping attack by predators in which several individuals perished, leading to the dwindling of their numbers and ultimate extinction.

But it may be argued that colours apart, one actually sees some actions of males which cannot but be interpreted as their courtship activity. What is the answer to this? Here the writer presents possible explanations for their apparent courtship activity. Firstly, these actions are not for impressing the female but to warn other males away from her, in the manner of a bird making vocal notes keeping off intruders from its possession of a particular area. But it may be said that even when other males are absent, this activity is gone through before the female. The answer to this is that the very approach of a female triggers

off through "Association of Ideas" a series of actions learnt by the male to keep off his rivals. The eminent Russiant psychologist, Pavolv, rang a bell whenever he placed food before his dog. Later even if the food was not before it, saliva flowed from the dog's mouth when the bell rang. Thus, even while the rivals are absent, actions meant for them are recalled to mind and the male goes through those actions before a female which we assume are meant for her.

Secondly, his activity might be aggressive, coming under what is called 'aggressive courtship'. Though this is a contradiction in terms, for courtship is meant to get favourable responses from the female, while attempting to obtain her aggressively is the opposite of it, yet it explains to some extent this particular behaviour of the male. We have to drop courtship from this term altogether for it is sheer aggressiveness. This is the general way in Nature for only a strong male can be aggressive enough and Nature wants these alone to mate, so that the offspring might be strong enough to face the struggle for existence.

Thirdly, it cannot be denied that when a female is near a male, there is a natural joy felt by the latter and he may give some movement to his body or feathers or he may even play with her. But these simple acts cannot be considered as courtship.

Certain questions the Reader may ask are now discussed. It may be asked "Why do some animals wear more brilliant colours during the breeding season than at other Times of the year. Is it not for wooing their mates ?" The answer is that it explains better the view discussed here rather than that of charming the female, for this is exactly the season when the males have to assume the deepest of colours to draw the attention of the enemy away from the gravid females and the weak young and to sacrifice themselves if necessary. Besides at this precious part of the year, the deeper colours lead to the needed immediate recognition of the sexes. The song of the bird also bears a higher pitch, for the mates have to discover themselves through their vocal notes as early as possible. The male's predator drawing activity reaches its maximum and becomes even ritualistic during this period.

It may again be argued by the reader with regard to self-sacrifice, that according to Darwinians, animals have characters useful to themselves, or others. How can they lead to self-destruction as has been claimed in this essay ? The answer is that we see among animals self-destruction or suicide for the survival of their race. Several examples can be given in support of this. Worker bees go and sting the intruders and they do not survive the attack as parts of their intestines come out with their sting. Parents risk death by attacking a stronger enemy if they find him close to their offspring. Many insects, for example, silk moths come out of the cocoons without mouths as if their only duty is to lay eggs to bring forth a new generation, not to eat and live. Rabbit-like Lemmings periodically migrate in their thousands to the seashore and drown themselves in water. This suicidal act is

generally thought to be their attempt at 'regulation of numbers', to adjust population to available food supply, and ensure moderate numbers with vigorous development instead of having large numbers with poor development, which might eventually prove fatal to their race.

Another question that may possibly be asked is, does not the death of the males through their sacrifice bring about diminution in their numbers ultimately effecting the survival of their race ? This question can be answered briefly thus: It is common knowledge that one male and four females can produce more offspring in a year than four males and one female. Nature can carry on reproduction with fewer males. So males when circumstances are dangerous as in the case of gallinea, have been given by Nature brilliant colours, not as it may now be clear to the Reader for courting the females but to save them with the help of these colours whenever occasion demands. In some cases the females have embellishments, though to a lesser degree, not to court the male in their turn but to play the part of the male when the latter is absent. They thus form a second line of defence to the young.

Another question that can be asked is "why should herons have white in both sexes except to woo each other"? The herons, some other birds and some reptiles too wear in both sexes, colours contrasting from their environment because, though there is predator hazard in it, yet their remaining together is of greater importance to their reproduction than an occasional attack by an enemy. Their spotting each other while feeding and especially when returning to their rookery is important for their survival.

"What about the Bird of Paradise" ? It may be asked. Are not its colours at least nuptial ones ? The answer is, they are colours of recognition and not of display. We must remember that its habitat is the equatorial forest of New Guinea, where rain falls throughout the year. Sun's rays hardly penetrate the umbrella like foliage of the tree tops. Those who have seen such a forest can have an idea about its actual nature. Our own monsoon forests are not much different from it. The Writer has personal experience of such a forest as he had to tour through the Western Ghats situated in the monsoon belt as an Assistant Inspector of Education. It is wet, evergreen, with semi-darkness prevailing even at midday. An entire area is called 'KATLE KAN',—forest of darkness. In the habitat of the Birds of Paradise, conditions are worse. The dense mist creating poor visibility, makes it difficult for them to move from tree to tree in search of food and to return to their rookery together in the evening. They can be compared to fish in the depths of the ocean which go about emitting cold light, chiefly to keep themselves visible to others of their kind. Birds inhabiting thick vegetation, generally adopt intensified colours, for example, the great parrots, toucans, tragopans, etc., in order to be spotted the better by their kin. In addition they make some movements too. The male of a species of the Bird of Paradise actually hangs upside down to let the wings

fall down in order to be seen better. This movement of the male is wrongly thought as display of colours to cater to the fancy of the female. But such movements are generally to be found among the birds of dense vegetation. The smaller the bird, the more restless it generally appears. It turns its head from side to side and hops from branch to branch apparently for no purpose. Through this movement it keeps itself visible to its fellows. The small parrots, budgerigars miscalled love-birds even touch each other's body and beak, whether it is a male or a female, to feel their neighbour's presence. This is wrongly called kissing, an act which man adopted after he reached a stage of civilisation, to express his affection. The writer separated the male and female budgerigars and kept them in different cages. Even then they touched each other's body or beak. Now it may be clear to the reader that the Bird of Paradise displaying his colours has nothing to do with the charming of the female but is only an act relating to the recognition of each other by giving movement to its body or feathers. If wooing the female were its purpose its facial appearance would have been more handsome. As it is, it reaches an anticlimax here, for its head is that of a crow with its ugly beak, because it actually belongs to the species of the crow. The greatest obsession with such birds of dense vegetation is to see and be seen by their fellows and to feel each others presence, hence their colours and movements.

Just as the Bird of Paradise is put forward as an example of 'colours for courtship', the pigeon is cited as an example of intense wooing activity. Certainly the pigeon is one of the, if not the most, demonstrative of birds. He fluffs up his feathers and fanning down his tail-feathers, appears to keep up a regular dance near a female, cooing all the time. Is it his courtship ? Certainly not. There is a reason for his antics. The rockpigeon from whom the domestic one has descended, seeks out a nesting place in crags and cliffs and does not build a tree-nest, usual to most birds. Suitable nesting holes are not generally found adequate to the number of pairs needing them, so, a male when he finds one, uses all means in his power to keep out other males. He impresses them by appearing bigger in size through fluffing up of his feathers, makes other movements and utters cooing sounds. Other pigeons are kept away by his boistrous activity. His using the same tactics near a female to advertise his possession of her has resulted in an advantage to him. Any unattached male or the one who has reached his adulthood and is seeking a mate is thus kept away from her. If wooing of the female is believed in, why should he charm his own mate several times a day and all his life ? It would be meaningless, for pigeons are reputed to pair for life. His indulging in this activity is thus only to ward off a wifesnatcher. By habit, even when he is alone or near any other female, he is seen going through this activity. So this act should not be mistaken for the wooing of the female. His intense activity shows another fact. Several kinds of birds make up for the lack of offensive weapons by being demonstrative to a larger degree. They lack the spur of a gallinacious cock or the strong beak of a

hawk to drive away their rivals. Therefore, they have to be demonstrative to a larger degree.

It is high time we give up these out-dated theories. Even Hugh B. Cott, the present day authority and whom Huxley calls the last word on animal coloration is silent on the subject of courtship and the colours that are associated with it. This may be due to the fact that he may not believe in colours in the body, fur and feathers of the animals being used for charming of the females.

If the Reader has been sufficiently convinced that the socalled display or nuptial colours of males are not used by them for their sexual display but are exclusively employed by Nature to set out the males for sacrificing themselves for their group whenever occasion demands, and that they are more forward with the aid of these colours in offering themselves for sacrifice than hitherto admitted, then these colours may be treated as a separate category by themselves and called "self-sacrificing colours" of animals.

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In 1970, a handful of dedicated men transported 41 magnificient specimens of the Rhodesian Black Rhinoceros which like the Great One Horned Indian Rhinoceros had reached the brink of extinction to the safety of well patrolled game reserves.

Observations on the fauna of Nagarjuna Sagar, Andhra Pradesh; with special reference to the mammals

by

Y. Chaturvedi*

An extensive zoological survey of the Nagarjuna Sagar, a dam project, and its adjacent areas was taken up in 1962 by the Zoological Survey of India. This survey was to be carried out in two parts; one, before completion of the dam, and the other, after its completion. The object of the survey was to study the fauna of the area to be submerged in the reservoir of the project, and the adjoining areas, before and after the completion of the Nagarjuna Sagar Dam, so that the change in the biota and ecological succession could be studied.

The first part of the proposed survey, i.e., before the completion of the Dam, was undertaken in two trips, one from July to September 1962 and the other from September to November 1963. The first trip covered the rainy season, during which, populations of some groups of the fauna viz., amphibians, insects etc. are on the increase and most active. The second trip commenced during the post-monsoon period when many species are expected to gradually slow down their normal activities as winter conditions approach.

Nagarjuna Sagar is situated near Nandikonda in Nalgonda district of Andhra Pradesh. The Sagar is named after Acharya Nagarjuna, a Buddhist priest of bygone days and a renowned chemist and Rector of the University once situated in the Nagarjunakonda Valley. The Sagar on the turbulent Krishna river, covers an area of 35 sq. km. approximately, and includes parts of Nalgonda and Guntur districts. The area has come into prominence because of the archaeological excavations which depict the culture and civilization during the 2nd century A.D. Besides the Nagarjunakonda Valley, villages like Nandikonda, Vijaypuri, Yellashwaram, Rayawaram, Gangarajpallu, Nidigul, Suryaraopet, Madhawaram, Peddamunigal, Azmapur, Pendlipokula, Dindi, Deverkonda and Macherla, which lie between 16°00-17°01′ N and 78°58′-80°00′ E, were also surveyed.

The ranges of the Naliamalai Hills are broken and their altitude varies from 300 to 400 metres. In between these hilly ranges are large and small valleys. The soil consists of sandstones, quartzites and granite. It is red and devoid of humus.

The climate is mainly hot, the mercury rising above 43°C from April to June. From July to September the temperature varies between 25°C, and 30°C and the high humidity makes the heat oppressive.

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The flora of the region can be divided into four types: (1) the plains—herbs, shrubs and trees, (2) the foot-hills-scrub jungles, (3) the slopes of the hills-thorn forests, (4) the hill tops-dry deciduous forest. The main plants of the area are: *Borassus flabellifer*, *Cleome viscosa*, *Indigofera cordifolia*, *Crotolaria medicagnea*, *Portulaco oracea*, *Heteropogon contortus*, *Cynodon dactylon*, *Acacia latronum*, *A. chundra*, *Bauhinia racemosa*, *Albizzia amara*, *Cassia fistula*, *Commiphora roxburghii* and many xerophytes. A comprehensive account of the flora is given by Thothathri (1964).

Very little is known about the fauna of Andhra Pradesh. Many of the earlier reports, like that of Jerdon (1874), Blanford (1888-91), Pocock (1939) and the Gazetteers of Hyderabad State (Khan, 1909), and Madras (Francis, 1908), Ellerman & Morrison-Scott (1951) and Ellerman (1961) mention the fauna of Madras or of the southern Peninsula which covers the present Andhra Pradesh. Inadequate knowledge of the fauna of the area necessitates an extensive faunal survey. This is all the more necessary since the establishment of the Nagarjuna Sagar and other projects like Srishailam, Warangal, Dindi, etc., when completed, must have their impacts on the fauna too. In this article I have dealt with my observations on the animals of the area, especially the mammals.

1. J. VERTEBRATES

1.1 *Mammals*

The mammals constitute the most conspicuous fauna of the area. Though larger mammals have become scarce due to disforestation and regular human interference, small forms were seen in adequate numbers. All the species observed are reported here although many of them could not be collected. While the medium sized mammals were collected by shooting, smaller forms like rats, squirrels, etc., were generally trapped. Three types of traps, namely, the Petrol-tin type (Roonwal 1949), the Break-neck type and the Cage type were employed, but only the Cage type gave satisfactory results. Pieces of "Chapati", foodgrains, pieces of boiled meat and fish, and some fruits, were used as baits. Bits of guava fruit were found a good bait, especially for squirrles.

1.1.1 *Insectivores*—The Common House Shrew (*Suncus murinus*) was seen during the nights near drains of houses at Deverkonda. Their shrill note is very distinctive. Local people think it to be poisonus. Strangely, the people are silent about its odour, which is well known in northern India.

1.1.2 *Chiroptera*—Among the bats, large numbers of Flying Foxes (*Pteropus giganteus giganteus*) were noticed visiting a guava plantation at Deverkonda during the night. When light from an electric torch was directed upon them they stopped feeding and as soon as the light was put off; they flew away.

The pipistrelle bats were seen flying at dusk. Examples of two species of Horseshoe bats, namely, *Hipposideros speoris* and *H. bicolor*, were collected from a cave near Ethiopotla

Falls. They were found hanging from the ceiling of the cave, which was very low and uneven. Inside the cave there was a huge deposit of guano and the usual foul odour. The bats were collected by using handnets. It is interesting to note that colonies of the two species were found at the same place. The yellow bat (*Scotophilus temmincki*) was captured at Macherla Inspection Bonglow.

1.1.3 *Lagomorpha*—The Black-naped Hare, *Lepus nigricollis*, was very common and many specimens were collected. They came out mainly at dusk and dawn, though at dawn they appeared in fewer numbers. Occasionally, they were also met with in broad day-light, but in undisturbed places only. They took shelter under large bushes especially when the branches covered the main trunk nearly up to the base from all sides. For feeding, they selected undisturbed small areas of grassy land surrounded by stunted trees and bushes, but frequently were noticed grazing along the sides of the forest tracks. The airport area on the way to the dam site, appeared to be their paradise. They were seen in large numbers there, during our regular nocturnal visits.

The hares were seen to come out at twilight, and return to their burrows between 10 p. m. and midnight. After dusk, they were seen crossing the road from the riverside towards the airport (Map 1), but while returning they were noticed to go back to the river-side. The possibility of another batch going to the north of the road, i.e. riverside, for feeding appeared very remote, because there was neither good grassy land to the north, nor was any hare seen going there at dusk. The northern jungle area was very close to the river bank and there was every possibility that they went there to drink water before going back to their burrows. However, this could not be ascertained as the jungle on the river bank was rather dense and there was no track approaching the river from the roadside.

The coloration of the hare, that is, sandy, mixed with some black, is procryptic. When suddenly flushed, they made away with lightening speed. If chased, they suddenly froze behind some rocks, boulder, bush or even in dry grass and their coloration so blended with the surroundings that it was difficult to locate them.

Blanford (1891) and Prater (1965) give October to February as the breeding period. In the area under study, we have taken specimens with well developed mammae on July 29, and a pregnant one on September 17th. It would appear, therefore, that in this area the breeding season is from June to September. During this period, females appeared to be very active as evidenced by their larger number in the collection. However, the season probably varies from area to area depending perhaps, upon such factors as daylength, availability of food, climatic conditions, etc.

As regards the litter size, Blanford (1891) held that only one young is produced, but quoting Hodgson, he cited the birth of two young ones in captive females. However, we

have taken two foetuses from a single female (September 17, 1962), and this confirms that two young are produced at a time in the wild state too.

Many local people kill them for meat by axe or even by stones. Blanford (1891) said the meat was not so tasty, but "it may be due to poor cookery". I would agree with the latter part of his opinion, for the meat is tender and tasty. According to local reports, they are preyed upon by some birds, like the Horned owl, falcon merlin, shikra etc.

1.1.4 *Rodentia*:

1.1.4.1 *Sciuridae*: The Five-striped (*Fu nambulus pennanti*) and Three-striped (*F. palmarum*) palm squirrels were common on bushes and trees. The Five-striped species were seen near human habitation or tracks but the three-striped ones were noticed mainly in forests. They were found to be most active in the early hours of the day, on such plants as mehndi (*Duranta plumeri*), karonda (*Carissa carandas*), sharifa (*Anona squamosa*), etc. The call of the Five-striped squirrel was very sharp and distinctive and one could be sure of its presence even from a long distance The call of the Three-striped squirrel was easily distinguishable from that of the Five-striped one. They fed mainly on fruits, always keeping very alert and even a slight noise made them scurry away to security, giving loud alarm calls.

1.1.4.2 *Muridae*: The murid population is high in this area. A specimen of the Indian Gerbil (*Tatera indica*) was seen at Nagarjunkonda feeding on the leaves of ak (*Calotropis procera*). On our approach it ran away to its burrow. In the next half hour during which we watched the burrow, it peeped out three or four times but never ventured out.

Many examples of the House Rat (*Rattus rattus refuscence*) and the Lesser bandicoot (*Bandicota bengalensis*) were trapped from huts and fields, and a badly damaged and decomposing specimen of the Large bandicoot (*B. indica*) was also brought in by a local person. The House mouse (*Mus musculus*) was also captured from the huts.

The Little Indian Field mouce (*Mus booduga*) was also recorded; one specimen was found under a piece of rock in a jower (*Sorghum* spp.) field and another from a ploughed field. The stomach-contents of these species were examined. Foodgrains and leaves were found in the pasty contents of the House rat, (*B. rattus rufescence*) stomach. In *Mus musculus* the stomachs were full of bits of rice, gram, wheat and some yellow pasty mass. In *M. booduga*, the stomach-contents consisted mainly of pieces of leaves and a few grains of jowar (*Sorghum* spp.) or bajri (*Pennisetum* spp.). In the Lesser bandicoot (*B. bengalensis*) the stomach had seeds, some pieces of leaves and sometimes a few legs or other parts of insects. In one or two specimens, a few very small pieces of stones were also found. These may probably have been accidentally ingested along with other food material.

During the period, July to September, many juveniles of *R. rattus rufescence* were trapped, which indicates that the breeding period was not long over. On August 1, 1962, a pregnant

female was caught, from which six foetuses were recovered which probably indicates the litter size.

1.1.5 *Carnivora*: Big carnivores like the leopard (*Panthera pardus*) were reported to occur in the area but none could be seen inspite of many night-watches. It may be due to disforestation and increased human interference. Among the medium sized carnivores, the Common Civet cat (*Paradoxurus hermaphroditus*) was seen twice on the way to Macherla from Nagarjunkonda. A dead civet in a decomposed condition was found on the slope of the Nagarjuna Hill. The fox (*Vulpes bengalensis*) was seen on three or four occasions even in daylight, but they appear to be rare The jackal (*Canis aurius*) was seen very often during the day or night, and a specimen was collected at Madhawaram.

The Sloth bear (*Melursus ursinus*) was claimed by villagers to be present and an incident of molestation of a "Lambadi" (member of a Schedulde Tribe) near Madhawaram was heard, but we did not come across the bear. A jungle cat (*Felis chaus*) was shot between Nagarjuna and Siddelderi hills, near a nullah approaching the Krishna river. The local people reported that a wolf was visiting the river regularly for water. However, we saw only the jungle cat mentioned above, at that place. Another was seen in the Tiger Valley at Vijaypuri North during the daytime.

Among the smaller carnivores, the Long-tailed mongoose (*Herpestes smithi*) was once seen at a close range on the southern slope of the Firangimotu Hill during the morning hours. On other occasions it was generally seen in thick reeds along the nullah traversing through the valley.

1.1.6 *Artiodactyla*: The sambar (*Cervus unicolor*) and the Wild boar (*Sus serofa*) were found, but are rare. The Indian gazelle (*Gazella gazella bennetti*) and the cheetal (*Axis axis*) were reported by local people. A young specimen of the boar and that of Indian gazelle were procured. The latter was caught alive and kept for a few weeks in the camp. It was bottle-fed on cow's milk but sometimes milk was poured directly into its mouth. Terminal delicate leaves and grasses were also offered but it took them only after long persuasion. The occurrence of the cheetal could not be ascertained as none of us saw it there.

1.1.7 *Primates*: Primates appear very rare in this area. It was only at Nagarjunkonda that a colony of four or five Rhesus monkeys was seen in the interior of the forest on the top of Eddenmotu Hill. It was very difficult to procure them and the party could collect only one (*Macaca* sp.) specimen It resembles *Macaca mulatta* to some extent, but southern distributional limit of this species happens to be the Narmada river, according to Ellerman and Morrison Scott (1951). Lack of radiating hairs on its crown confirms that it is not *M. radiata*, a species so common in the south. The Langur (*Presbytis* sp.) was said to occur in the area but we never came across any.

1.2. *AVES*

The avifauna of the area is very rich and varied. The cacophony of various kinds of birds added life to the calmness of the valley. The call of the Peafowl was a usual feature and reverberating from one end of the valley to the other. The Common baya was seen nesting on bushes in addition to palm and babul trees in the Nagarjunkonda valley. The following birds were collected or seen within the area.

1.2.1 *Ciconiiformes*—The Little egret was seen near the river banks. The Cattle egret was found in different habitats, like river banks, fields, as well as following grazing cattle. A roost of the Cattle egrets was seen at Rayawaram near the bank of the Peddavagu river. At evening or early morning the whole tree looked like a big white umbrella. The Pond heron was found near rivers, ditches and other accumulations of water.

1.2.2 *Falconiformes*—White-backed vulture, Scavanger vulture, Brahminy kite, Pariah kite, Laggar falcon and Red-headed merlin were found

1.2 3 *Charadriiformes*—A stone curlew and a little Ringed plover were found on a forest track at night. A Redwattled lapwing was shot near a ditch on top of Nagarjuna Hill, it was one of a pair and its mate raised a continuous cry, spreading alarm among other animals on the hill-top.

1.2.4 *Columbiformes*—Common sandgrouse, Spotted dove, Ring-necked dove and Blue Rock pigeon were found.

1.2.5 *Psittaciformes*—Rose-ringed parakeet and Blossom-headed parakeet were available but not in plenty.

1.2.6 *Cuculiformes*—Only the koel was found.

1.2.7 *Strigiformes*—An Indian Great Horned-owl was shot while it was perching on an electric pole near the new museum on the hill-top. A Spotted owlet was also found in this area.

1.2.8 *Caprimulgiformes*—The Common Indian nightjar was very common. It was found on forest tracks or on grassy ground during the night, its eyes blazing red in the jeep light. It was difficult to locate due to the concealing coloration, but its presence could be noted by the "red" eyes.

1.2,9 *Coraciiformes*—Whitebreasted kingfisher, Common kingfisher, Common Green bee-eater, Large Green bee-eater, Indian roller and hoopoe were found on the river bank, small bushes and in open areas.

1.2.10 *Piciformes*—The Goldenbacked Wood pecker was seen drumming on the trees and the Crimsonbreasted Barbet was also observed.

1.2.11 *Passeriformes*—Among the passerines the following birds were common: Indian pitta, Ashy-crowned finch lark, Common swallow, Baybacked shrike, Rufousbacked shrike, Black drongo, Rackettailed drongo, Brahminy myna, Tree-pie, House crow, Redvented bulbul, Common babler, Jungle babler, Magpie robin, Pied bushchat, Indian robin, Blue rock thrush, Gray wagtail, Pied wagtail, Tickell's Flowerpecker, Purple sunbird, House sparrow, Common weaver-bird, Streaked weaver-bird, Red munia.

1.3 *REPTILES*

The reptilian fauna was also found to be quite rich. Various lizards, Skinks and Snakes were very common and seen everywhere.

The Blind snake (*Typhlops* sp.) was found under stones. They fed on termites. The Rat snake (*Ptyas mucosus*) and the cobra (*Naja naja*) were caught near huts at Pullareddy-gudum. A dead Python (*Python mlourus*) was seen lying on the road leading to the Dam site from Nagarjunkonda, most probably crushed under the wheels of some heavy vehicle. The Sand boa (*Eryx* sp) was also found but not very commonly. The Water snake (*Natrix* sp.) was seen in areas with an accumulation of water. A specimen of the Green Whip snake (*Dryophis* sp.) was collected on a Jowar stem in a field. A Banded krait (*Bungarus fasciatus*)) was seen at Nagarjunkonda near the old Archaeological Museum.

Among the lizards, the Garden lizard (*Calotes versicolor*) was very common. The Wall lizard (*Hemidactylus* sp.) was collected from the houses. The Indian Monitor lizard (*Varanus monitor*) was only rarely available. Skinks (*Mabuya* sp.) were very common under bushes, stones or even on open ground.

Two specimens of the turtle (*Trionyx* sp.) were collected from big ditches. A juvenile crocodile (*Crocodilus* sp.) was caught at the dam site by fishermen.

1.4 *AMPHIBIA*

The amphibians perhaps do not find this place very suitable, for very few were seen. The common toad (*Bufo melanostictus*) was seen in good numbers everywhere, even under stones and in the labyrinths of termite mounds. The Bullfrog (*Rana tigrina*) was found in pools and ditches. The Skipper, *Rana cyanophylyctis*, was found mainly in small ditches or shallow places filled with rain water.

1.5 *FISHES*

The main source of fish in the area is the Krishna river and its tributaries like Peddavagu and Dindi. Some small pools, ditches and the nullahs also provide fish for the local people. The following species of fishes were available in the area:

Heteropneustes fossilis, Wallago attu, Ompak bimaculatus, Aila coila, Mystus aor, M. seenghala, Rita goqua, Arius jella, Bagarius bagarius, Naemachilus densomi, Garra gotyla, Labeo fimbriatus, L. calbasu, L. bata, Cirrhinus cirrhosa, C. reba, Catla catla, Amblypharyngodon mola, Puntius Sarans, P. chola, P. Kolus.

2. *INVETEBRATES*

The invertebrate fauna of the area is very rich. Land molluscs: *Planispira contracta, Ariophanta ligulata, A. interrupta, Zootecus insularis* etc. were found in different places, under stones or on bushes. Aquatic species: *Pila virens, Indoplanorbis exustus, Lymanaea luteola, Melanoides pyramis, Viviparus bengalensis, V. variatus* etc. were also well represented in rivers, nullahs, ponds and pools etc. Among the crustaceans, crabs and shrimps were of common occurrence, in rivers and nullahs. Isopods were found under almost all stones.

Scorpions were found in abundance mainly under stones. Spiders were found on the water surface, weeds, grasses, plants, as well as under stones. False spiders were found in small pits under most of the stones. The red Valvet mites were seen in large numbers on the ground specially after rains usually by the sides of tracks. Among myriapods, centipedes and millipedes were very common. Centipedes were found in dry places whereas millipedes were generally met with either in damp and moist parts or near water.

Insect fauna was very rich and found everywhere, from water to land and on trees and bushes. Ant-hills of great size catch the sight of any visitor. They look more prominent and attractive due to the red soil. Among the insects, beetles, blistertails, moths, butterflies, dragonflies, houseflies, mayflies, wasps, bees, ants, bugs, aphids, crickets, grasshoppers, locusts, cockroaches, mantids, termites, earwigs etc. were very common.

Some earthworms and leaches were also collected, but they were not found in abundance.

Animal Association

The assemblage of different groups of animals at one place or under one shelter, was found very interesting. In spite of great diversity in their habits, different groups of animals were found sharing a common shelter, under the same stone or near the roots of plants and bushes, in crevices of rocks. Such examples may be grouped as follows:

(i) Under stones: False spider, *Thysoneura* and *Isopods* were most common. Sometimes they were accompanied by centipedes, termites, beetles, scorpions, gastropods and *Typhlops*. In moist places or near water accumulations, earthworms, earwigs, millipedes and on rare occasions toads and lizards were also found.

(ii) Under bushes: Usually spiders, termites, beetles, and bristletails, gastropods were found, with beetles as the predominent group. Garden lizards, skinks, and young snakes were sometimes found under bushes.

(iii) Ant-hill holes: Land snails, beetles, bristletails, centipedes, millipedes, spiders and garden lizards constituted the most typical animal association of a deserted ant-hill. Sometimes snakes were also seen peeping through the holes of these ant-hills.

Sometimes crevices of rocks were also used as shelters by some animals like snakes, lizards etc.

It was noticed that at the places where larger forms like scorpions, lizards, *Typhlops* or young snakes were present, the number of smaller ones like those of beetles, termites, centipedes etc. was less or even absent. There can be two reasons for this, firstly, the presence of big animals reduced the accomodating capacity of the particular shelter, thereby leaving inadequate space for the smaller animals. The second reason may be their predatory habits, which repelled the small ones. (It does not mean that larger forms are always predating on smaller ones). It may be true only in specific cases, for example, the presence of *Typhlops* may have a lowering effect in the number of termites. But I cannot give stress to the second cause as in many cases prey and predators were found under the same stone. However, once I kept a false spider and a *Typhlops* in the same tube. There was fierce fighting between them and at last the reptile was cut into pieces by the strong mandibled spider. As such the first cause i.e. the accommodating capacity of the shelter in relation to the size of the occupant, appears to be the prime factor controlling the population and indirectly the nature of association too.

Regular human interference and disforestation etc. in the Nagarjuna Sagar have disturbed the animal life to a great extent. The threatened species are migrating to other safer zones and becoming very scarce in this area. Specially, the big mammals are struggling hard for their extistence. It is expected that further development and industrialization of the area will cause greater adverse effects on its fauna. However, the State forest authorities have shown great consideration by declaring more than one nearby forest as "Reserved". The treatened species of the Sagar area may get well protected shelters in these "Reserved Forests". However, it all depends on how the laws are implemented. The forest authorities are considering setting up of a zoological park on one of the island hill tops. The State fishery department also has started fish culture and very soon different species of fish, prawns, crabs, etc. will probably grow in numbers.

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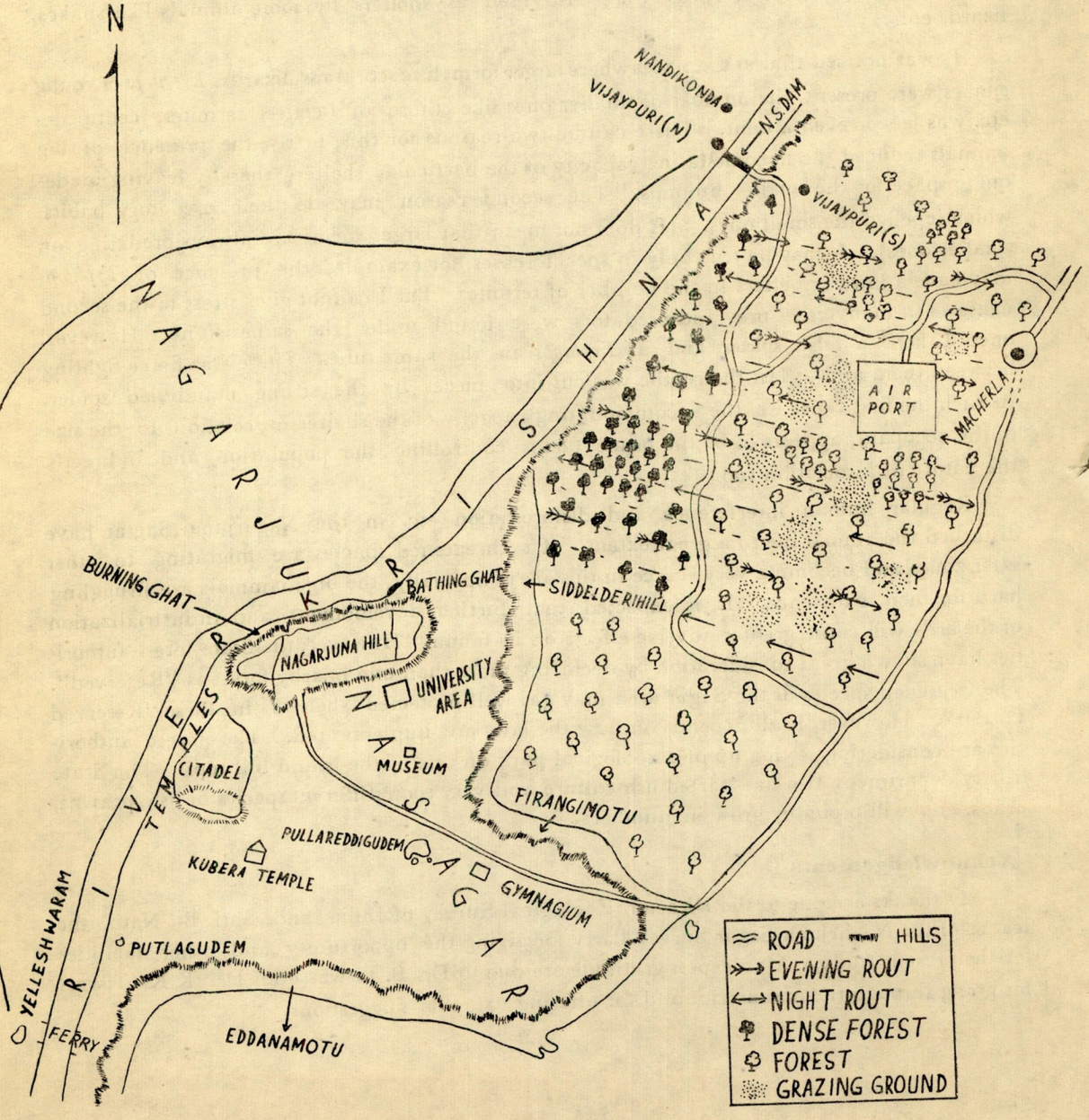
SKETCH MAP OF NAGARJUNA SAGAR AREA SHOWING MOVEMENTS OF THE BLACK-NAPED HARE



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A Note on the Tiger Census

By

Arjan Singh

I am prompted to write this note on the tiger census by my intense concern for the future of this splendid predator—the diminution in numbers of such a prominent animal will highlight the deteriorating status of wild life in general and the essential interdependence of predator and prey species—and also by the fact that I originally sponsored the resolution which led the IUCN to recommend a moratorium on tiger hunting.

A census was carried out before the Meeting of the IUCN in 1969. A subsequent census again took place in 1970-71. Both these operations were carried out by the State Forest Department and seemed to agree, according to the figures produced. The census was conducted mainly by subordinate and untrained staff. The census sponsored by the Centre in 1972 made it the responsibility of the senior Territorial Officer in the Division who has a large staff working for him, and trainees from a short course conducted by the senior research officer at Dehra Dun were inducted to provide the expertise. The result has been that the the numbers in Uttar Pradesh have fallen by approximately 50%.

How revealing these figures are and what they reveal is not quite clear to me as I still doubt their accuracy. Many Divisional Forest Officers, I believe, feel that they are too busy to be asked to be in charge of such a census operation. Apart from being an ominous portent denoting the general attitude of the State Forest Department towards wild life, inspite of the genuine concern of the Central Government and International bodies, it has resulted in the effort of the Territorial staff being commensurate with the interest of the senior officer concerned. For instance, in North Kheri where the Divisional Forest Officer left the Division the day before the census, the tracings of pugmarks produced deformities which I hitherto thought possible only in humans. The variations seemed to denote a relay of tigers along some stretches of road and must have been most confusing to the Co-ordinator.

What is of real concern is that a complacency may be induced by the presentation of inflated figures, as the census has now become a monopoly of the Forest Department, and we have seen how the Department blamed the drop in numbers of the Gir lions and their cubs on predation by leopards and destruction by cattle. Tigers range widely and though the basis will be pugmark recognition, as individual sightings of such a secretive and nocturnal animal is not possible, the accurate collation and co-ordination of results is even more

important as I maintain that it is extremely difficult to tell the difference by their pugmarks between tigers of the same size, sex and age groups. Of the three tigresses who visit the precincts of my farm near the Dudwa Sanctuary, two are of the same size, but one has a toe of the left hind paw missing, and hence it is possible to tell them apart. The third is a smaller and younger animal and no problem arises at present. Of the three tigers two are again of equal size and perhaps from the same litter, and it is impossible to differentiate between them. Sometimes even when they have walked side by side along the same dust road, a sneaking doubt is prevalent as to whether the same animal may not have made the same journey twice. Yet these are two tigers as has been proved by visual and other circumstantial evidence.

Comparative studies are fairly simple, and should not cause any difficulty to trained observers, as far as sex variations are concerned. In the tiger the pad is wider, the toes larger and thicker and the general impression more square than the tigress whose pug is more elongated, the pad narrower and the toes comparatively thinner. Older and heavier animals will have the toes more splayed and there may be some distortion with age and also visible seams and cracks. Healthy animals will have a 'clear', demarcated pug. Unhealthy and emaciated specimens or those with a limp will have 'unclear' pugmarks. Normally a tiger places his hind paw somewhat in advance and partially overlapping his forepaw. Young animals usually have a wide clearance, and the hind paw fall well in advance. Aged animals with stiff joints may have a complete overlap. Speed of motion is another reason contributing to the placement of the pugs.

These general observations together with local peculiarities will prove of assistance to the enumerator, but the greatest hazard to any observer is the contributing factor of soil texture. A rough classification of major soil conditions may be: 1. Light dust; 2. Heavy dust; 3. Hard ground; 4. Clay; 5. Mixed; 6. Sand; 7. Slush. Moreover, it is impossible to standardise these conditions as there can be variations of light dust or mixed sand etc. and, in any case, in the absence of any standard for an assessment, this rule of thumb appreciation will vary with different observers. Light dust to one enumerator may be a medium soil condition to another and on this basis of measurement the co-ordinator will produce two tigers where really one exists.

It must be realised that a tiger though by inclination a lazy animal, will cover large distances in a night in search of prey, and the census will have to be of an entire forest block no matter how large. Therefore to say that the Corbett National Park has 76 tigers means nothing, as apart from tracer distortion these tigers may also be counted in Mandhal, Sitabani and elsewhere. It is my contention, therefore, that our figures are inflated and will

continue to be inflated if we use the tiger tracer as the sole means of recognition. It is unreliable mainly because of its dependence on the human factor. 1. Tracings by unqualified personnel are not accurate. 2. Appreciation of soil conditions is likely to vary with each enumerator and will be devil the task of the co-ordinator. 3. Slight differences in measurement will take place due to comparative differences in soil texture, and the angle of reading from an ordinary tape measure. A pair of callipers may partly obviate this defect, but I feel that the imponderables of the working of a medium with so many type variations by ad hoc personnel is going to produce many more tigers than we have.

However, the great interest which is being taken in censusing tigers is in itself an extremely healthy sign in venting the concern we feel for our first animal, and if we use succeeding censuses as an empirical basis to improve our future technique we are sure to arrive at a credible figure eventually. The States are not sold on wild life conservation and it is only the immense prestige of the Prime Minister which has impelled them to accept a *fait accompli*. The commercial shikar companies also wait hopefully in the wings for political windfalls, and the production of inflated figures may well prove such a windfall.

I will therefore conclude my categorical statement that the tiger tracer cannot produce an accurate assessment of population dynamics by itself, by adding that, though the enumerator/tracer will have his place in providing comparative material for the distinction of sexes and local peculiarities, the co-ordinator will be the vital link without which the whole operation will be a failure. He will have to be highly qualified in recognition in the field and must have such mobility as to be able to check the work of the enumerators under his jurisdiction. He will be posted to an area of about 100 sq km at least three months before the start of the census so that he can gain first hand acquaintance with the habitats, habits and numbers of the local tigers and will therefore be in a position to check any inflationary tendencies due to discrepancies in measurement. These co-ordinators should be equipped with cameras and black and white film which is likely to present a truer picture of pugmarks in the field. He will be in continuous contact with his counterparts in other blocks and will therefore know before the commencement of the main census, what range overlaps take place among the tigers of the area. I feel that if we accept the co-ordinator as the vital link and not the enumerator, we will be on the right path as errors in the field will only be magnified in the office.

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The Forest Environment—Concerns For Its Future

PRAKASH N. MISHRA

Many of our concerns today relate directly or indirectly to the use of the forest and what forest lands produce as goods and services. A more livable environment is a common desire. More space and solitude in which to recreate, more aesthetically pleasing countryside, more fish and wildlife, more clean air and water and more fully-developed recreational facilities are needed. The agricultural, industrial, and domestic institutions that society is creating to support its wants and needs will require increasing amounts of good quality water. The demand of wood based products, such as furniture, paper, disposable fibre products, etc., is ever on the increase.

All of these wants may be classified into four major areas of concern:

1. A livable environment with clean air, aesthetic countryside, quiet, and room to recreate.
2. Plentiful supplies of high quality water.
3. Adequate timber supplies for consumer wood products.
4. Abundant recreational opportunities and facilities and plentiful fish and wildlife.

The demands of society and the concern for meeting the demands produce conflicts about the use of the forests and plans for their management in the future. The conflicts spring from existing or predicted shortages in the resources brought about by burgeoning population and ever growing industrialization.

Are these predicted shortages real ? Is there a justified basis of concern ? Do the conflicts over the allocation of forest resource uses primarily arise from emotional misunderstandings ? Will apprehension disappear as intelligent people learn more about alternative solutions to problems and the requirements for the management of timber, water, and recreational resources ? Will an advancing technology provide the knowledge and the tools to replace concern with a confidence in the forestry future ?

These are not easy questions to answer. Some light can be shed upon the problem by reviewing some of the more significant trends in forestry—trends that are arising out of concerns about forest resources. Some discussion of the technological changes that may lie ahead is also in order.

The Resource Situation

Inventories of timber supplies may show an abundance of wood but quality seems to be on the decline. Even with stable prices, analysts estimate, demand for wood will increase. By almost any yardstick used, the over-all demand for wood-based products will greatly

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overtax supply capabilities unless current timber management and utilization practices are substantially improved.

The wood supply problem is being intensified by a steady encroachment of other demands on timber-producing lands. Thousands of acres of forest land is taken over every year for city expansions, urban sprawl, highways, transmission lines and other non-timber growing purposes. Rapidly increasing land values are making forest lands easily available for uses which promise greater monetary returns.

Water usage and wastage is another important factor. Every year the domestic, industrial, agricultural, and recreational demands for bounteous supplies of high quality water increase. The forests and associated mountainous range lands produce a large portion of the total water supplies. But even in well-timbered and well-watered areas, water management problems exist. Just about everything we do affect the quality, quantity, or the availability of water in point of time.

Controversies over impoundments of water are not uncommon. Studies of rivers are required for special designation and special future use restrictions. Increasing pressures from recreationists exist to add to the problem of providing adequate experiences for those who wish to enjoy the beauty, fish and game, solitude, or developed mass-recreation areas. Pressures by users of some wilderness areas threaten to destroy the very purpose of such areas.

So there seems little doubt that resource shortages are real and are likely to become more critical unless the demands somehow level off.

Alternatives That May Not Be Right

Most of the uncertainty and concern over forest resource activities tend to centre on timber harvesting or management activities directly related to wood production. Logging and road building can cause erosion and stream sedimentation, impairing fish habitat. Clearcutting is aesthetically displeasing to many. The burning of logging slash fouls the air with smoke. The use of pesticides or herbicides to control insects or aid establishment of desirable seedlings contaminates soil, air and water– or so at least people claim.

If predictions are correct that we do need increasing quantities of wood—what, then, is the answer ?

Some critics of timber production reason that substitutes for wood can take over and meet the needs for fibre and solid wood products. Parenthetically, one may observe that constraints on efficient production of wood might actually price wood for some uses right out of the market. But how about iron and steel as a substitute for wood products in house-building ? This needs exploitation of iron ores farther than otherwise and can lead to severe

air and water pollution problems of its own. High tonnages of coal are needed for processing the iron ores and the mining of which has its own pollution problems as far as water resources are concerned. Furnaces belch out clouds of toxic fumes. Is this a good trade-off for lumber and plywood production ?

Aluminium, another wood substitute, requires large quantities of power in its manufacture. But environmentalists are concerned about more impoundments on waterways, or worry about water temperature changes induced by nuclear reactors that generate the needed power. Substitution of plastics for wood fibre products means more petroleum used with the dangers of more off-shore drilling disasters, more super-tankers, super oil spills and more petro-chemical complexes with pollution problems of probably a larger magnitude. The fact that petroleum has alternate uses in other more critical areas is another factor to be considered. The disposal problem brought about by all sorts of non-biodegradable plastic containers is worrying most of us too.

If we need wood, water and recreation and if wood production conflicts with the other resource uses, why not allocate forest lands selectively to the best single use ? This practice has been followed to a certain extent.

What Should We Do ?

In a democratic system of government the wishes of the people are the bases on which policy is formed. Sometimes it takes a long time and much backing and filling before sound policies are generated. So it behoves us all to understand as well as we can the alternatives open to us in forest resource management and the consequences of each.

Most professional foresters believe that the best way to overcome our concerns based on a short supply of all forest resources is through optimizing the mix of goods and service through intelligent and effective co-ordinated use. Said another way, we must learn how to make multiple-use work. Multiple-use practices must be applied with judgment and skill. They must be based on sound knowledge of production and utilization processes and their interactions.

Professional forest land managers of the future will be able to make multiple-use work within the context of society's constraints only if they have an array of technically feasible alternatives. Many of these are being developed now. Forestry research is being tailored to provide the manager with the knowledge that gives him a range of choices. The manager is becoming far more conscious of the user's desires and therefore better able to develop the course of action that comes closest to meeting the concerns of those he serves.

New Technology Is Part Of The Answer

Some in today's society would have us abandon technological advances on the grounds that new technology creates new problems. This is not necessarily true. We are not going to go backwards. We are not likely to uninvent the wheel. As a matter of fact, hope in overcoming the concerns for forest resource situation lies largely in more sophisticated technology. Let us look at a few of the obvious changes in sight.

It is believed that research will show us how to produce four times as much usable material out of timber as we get now. Imagine, what such an achievement might do to the logging slash disposal problem that produces millions of tons of residue annually. Probably far less broadcast burning would be necessary with accompanying air pollution if a profitable use for logging debris existed.

Studies of the chemistry of lignin (an unusable by-product of most methods of pulp manufacturing) may lead to commercially feasible products from this material which is now burned, ponded, or dumped into streams with all the attendant pollution problems. Also, studies of bark utilization are likely to yield practical methods for converting this problem material into products of value which at the same time will extend our wood-based resources.

Regeneration and silviculture research, based on a thorough knowledge of ecology and ecosystem responses to the impacts of man, will yield new techniques of timber culture. It seems quite obvious that some modifications to clearcut silviculture will have to be developed. This does not mean that clearcutting is on the way out. But it does suggest, perhaps, that making multiple-use work need not always start with constraints of a system of relatively pure, even-aged, clearcut-and-regenerate silviculture.

Thus in some situations, the land manager may be better epuipped to deal adequately with landscape aesthetics without surrendering entirely the wood producing aspect of the land.

Hopefully, forest geneticists will come up with new races of trees in the future,selected and bred to satisfy the demands of an altered environment. Already we have in sight improved selections of certain trees that may grow ten percent faster than the average. Thus, perhaps, more growth can be concentrated on fewer acres. Who knows but that more shade tolerant selections of certain types of trees might be developed ? It would lessen the need for broadcast burning and herbicide treatment of brush, a practice now desirable to give the sun-loving varieties a chance to grow. The use of such a genotype, where feasible, would contribute to a cleaner environment.

More Changes

Past basic research on biological control of forest pests is on the threshold of a big payoff. Biological agents will be available in the years ahead to combat insects that can no longer be dealt with by highly effective chemicals which are now being outlawed because they persist in soil, water, and animal tissue. Sex attractants for bark beetles have already been synthesized and will be used in the future without endangering the environment.

There is every reason to expect that advances will continue to be made in road building and timber harvesting technologies with great gains in the way of soil stabilization and reduced stream sedimentation. A better understanding of geology and soil characteristics, and an ability to forecast reactions to disturbances from roads and logging is sure to come. We have seen the basic energy source used to move a log from a hillside change in the last hundred years from a team of oxen to a steam donkey to a diesel engine to a balloon to a helicopter. It is not right to believe that a final plateau has been reached where there will never again be an advancement in how to do such a job better.

One should expect many of the things that are done today in timber harvesting to be changed to make multiple-use work. It seems incongruous that as logging moves to a steeper and rougher ground and to smaller and smaller timber, to create larger and more costly machines to do the job. Probably the constraints of over-all sound resource management will bring about changes here.

Development of modified timber harvesting systems that are more compatible with aesthetics and soil and water values is likely. Moving pulp chips by pipeline is becoming a reality as most of the engineering principles involved have been worked out. There have been advances in recent years in balloon and helicopter logging. These developments mean that fewer roads are needed and the environment suffers less disturbance.

Forest landscape management has a poor record till now but foresters are learning. Landscape management and the art of developing and managing outdoor recreation depends on an understanding of people, their behaviour, and reactions to various situations and stimulii they encounter. Here, too, is an area where much research needs to be done. Few foresters have been trained in psychology and sociology. But there are scientists skilled in evaluating human needs and responses. One thing is surely needed for the future—the needs of people for amenities supplied by the forest will not be overlooked. One can expect much more skilful handling of "people problems" in future years.

Private industry and public land managing agencies are aware of many of the institutional factors that stand today as obstacles in making multiple-use work. Would an improved incentives program be desirable in solving some of the land management problems ? What kind of a program ? Are there legislative or regulatory road blocks that need overhauling so that multiple-use management may be better tailored to each problem

situation ? Are there better marketing systems that would make desirable but currently unprofitable practices attractive for the logging contractor or landowner and thus enable him to do a more acceptable job of land management ?

What Is The Rest Of The Answer ?

If new technology is only part of the answer to making multiple-use work, what else can be done ?

Most researchers who are responsible for getting the necessary background knowledge for resource managers have not yet fully recognized the importance of dealing with the entire system. Usually the physiologist cares little about understanding the broader context within which his own special work lies. The forest engineer works hard and effectively to improve the efficiency of a particular operation technology but with little close tie to the biological aspects of a problem. The silvicultural researcher concerns himself with maximizing tree growth and is not entirely conversant with woodlife food and cover problems. And so it goes.

Somehow we must begin looking at the whole system and be willing to observe, study, and evaluate together the interrelationships of biological, physical, and social processes. Such an approach still requires the individual work of the specialist but calls for an overall comprehensive and co-ordinated degree of research planning we have not yet had in many instances.

Also of key importance in the whole question of making multiple-use work is how to allocate the costs. If the public demands that forest resources be so managed as to relieve the concerns they have for solitude, wood, water, or whatever, only one person pays—the consumer. Of course, the distribution of costs among consumers can be regulated by governing bodies. But before sound regulation can be imposed the nature and distribution of benefits must be understood.

Some people feel that the trade-offs required to make multiple-use work are not well understood. We must strive for a better understanding lest faulty decisions cause us to make fateful mistakes in seeking the many benefits we extract from the forest.

Currently, any form of "conservation" that has utilitarian aspects is given a derogatory twist. Some strange aberration or form of tunnel vision in involved. Much the same aberration is apparent in debates on the allocation of resources of wildlands. There are certain values of these resources which are normally captured and made available through the operation of the market economy, and there are other values which are characteristically made available outside the market system, either through public ownership or as externalities of private ownership. One repeatedly hears the first referred to as economic values and the second group social values.

This is absurd in conception and unfortunate in effect, since it tends to impute a higher value to the second group than to the first. No doubt there are important social values to having lumber and plywood for housing and to having low-cost wood-based printing papers to undergrid mass literacy, just as there are social values to an attractive landscape and the opportunity to escape our metropolitan areas. Further, there are important economic values and economic issues in the values obtained outside the market system.

So, one of the things that needs to be done is the establishment of a better understanding of the total resource values we enjoy and the costs of obtaining each. Different groups of people use the forests differently. The slum dweller does not place the same value on a roadless wilderness as the person who lives in a penthouse and spends the summer at a hill resort.

Those who are concerned about the forest as an ecosystem—and rightly so—should not forget that they and it are part of a bigger ecosystem. The environment we want to improve, or to save as some may put it, is not just the forest wilderness. It is not just the stand of fast growing timber. It is not just a clear-flowing stream.

The environment is the whole complex of the world we live in—the city, the air, the forest, all parts of our world. The forest has a unique place, perhaps, in this complex because it supplies so many things we find necessary to life itself as well as to the pleasures and joys we extract from it. But we must realize we cannot tamper with one part of the system without affecting all other parts in one way or another.

We should hope that forests will supply us for ever with rich renewable resources. The technology and capability is within our grasp. But patience and understanding are ingredients we must be willing to add. If this is done the concerns for the future of the forests will lessen and fade in due course of time.

Indian Endemic Bird Species in Dehra Dun & Adjacent Hills

By

R.K. Bhatnagar[1] & Pradeep Misra[2]

SUMMARY

The object of the study is to see the proportionate occurrence of endemic species with different zoogeographical affinities in an area comparatively within distributional range of palaearctic and indochinese fauna and to see their zoogeographical and ecological significance, hence the zoogeographical analysis of 55 occurring endemic species within the area has been carried out. The occurring endemics are referable to 22 families, comprising of 31 genera, 43 species plus 7 relicts and 2 of questionable entity. The distribution of endemics in 5 distinguishable niches has also been dealt with. The percentage values of occurring endemics in relation to affinities, general and ecological distribution pattern has also been dealt with. The occurrence of endemics of palaearctic and indochinese affinities has been observed to be 12.6% and 11.4% respectively. The occurrence of endemics of ethiopian affinities to niches of higher hills (1.42%), lower hills (14.28%), grass lands (5.71%) and stony river banks (1.42%) has also been observed. Both of these are contrary to hitherto believed major dominance of indochinese fauna (12.6% and 11.4% respectively) and also the non-penetration of ethiopian fauna within the region. Natural zoogeographical factors which the species in nature adapt have been suggested along with the further need of the study of similiar aspects on the fauna in the Himalayan chain.

The aspect is hitherto unreported.

Introduction

Though, the zoogeographical studies on Indian aves started more than 114 years ago when P.L. Sclater (1858) proposed the oriental region. Yet, todate little is known on the aspect and the available information is from Blanford (1901); Salim Ali (1949, 64); Salim Ali & S.D. Ripley (1968): S.D. Ripley (1954, 61) and related aspects from Meinertzhagen (1952), Moreau (1952) and numerous papers of Dr. B. Biswas on faunistics dealing with distribution also.

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The need of zoogeographical studies has been clearly pointed out by Salim Ali & S.D. Ripley (1968) in the following words "Indian avifauna is one of the most interesting in the world and provides ample opportunity for further significant research in zoogeography and its related aspects of ecology." Keeping this in view, the aspect has been taken up in order to see the proportionate occurrence of endemic species with different zoogeographical affinities in an area comparatively within distributional range of palaearctic and indochinese fauna. And also to see the zoogeographical cum ecological significance thereof. Thus, the area under study appears to be most suitable. The occurring fauna has already been reported by the authors (Bhatnagar, R.K. & Mishra, Pradeep 1971-73). The anatomical characters have not been taken into consideration since their significance and affinities have already been recognised (Ripley, 1961). Instead, the distributional aspect has been taken into consideration in the present study, particularly within niches.

In the text at several places numerical figures are given. These are corresponding numbers of the species as in the synopsis by the authors (op. cit. 1971-73). The accepted affinities of the endemics are on the basis of S.D. Ripley (1961) and Salim Ali & Ripley (1968).

I. Occurring endemics within the area

The species are referable to 22 families, comprising of 31 genera, 43 species plus 7 relicts and 2 of questionable entity.

These are as follows:—

Sl. No.	Family	Syn. No.	Name
		Syn. Pt.—I	
1.	*Anatidae*	R	*Rhodonessa caryophyllacea* (Latham)
2.	*Accipitridae*	47.	*Butastur teesa* (Franklin)
3.	*Phasianidae*	84.	*Francolinus pondicerianus interpositus* (Hartert)
4.	,,	86.	*Coturnix coromandelica* (Gmelin)
5.	,,	88.	*Perdicula asiatica punjaubi* (Whistler)
6.	,,	90.	**Ophrysia superciliosa* (Gray)
7.	,,	91.	*Tragopan melanocephala* (Gray)
8.	,,	96.	**Catreus wallichi* (Hardwicke)
9.	,,	97.	*Pavo cristatus* (Linn.)
10.	*Charadriidae*	110.	*Vanellus malabaricus* (Boddaert)
		Syn. Pt.—II	
11.	*Pssittacidae*	148.	*Pssittacula cyanocephala bengalensis* (Forsters)
12.	*Cuculidae*	153.	*Cuculus varius varius* Vahl
13.	,,	162.	*Taccoua leschenaulti* (Lesson)
14.	*Strigidae*	172.	*Glaucidium radiatum radiatum* (Tickell)

Sl. No.	Family	Syn. No.	Name
15.	*Bucerotidae*	194.	*Tockus birostris* (Scopoli)
16.	*Capitonidae*	197.	*Megalaima zeylanicus caniceps* (Franklin)
17.	*Picidae*	207.	*Dinopium bengalense* (Linnaeus)
18.	,,	209.	*Dendrocopos himalayensis himalayensis* (Jardine & Selby)
19.	,,	210.	*Dendrocopos auriceps auriceps* (Vigors)
		Syn. Pt.—III	
20.	*Pittidae*	215.	*Pitta brachyura brachyura* (Linn.)
21.	*Alaudidae*	217.	*Mirafra erythoptera sindiana* Ticehurst
22.	,,	219.	*Eremopteryx grisea* (Scopoli)
23.	*Artamidae*	243.	*Saroglossa spiloptera* (Vigors)
24.	*Sturnidae*	245.	*Sturnus pagodarum* (Gmelin)
25.	,,	248.	*Hirundo fluvicola Blyth*
26.	,,	249.	*Acridotheres ginginianus* (Latham)
27.	*Corvidae*	252.	*Garrulus lanceolatus* Vigors
28.	*Campephagidae*	267A.	*Coracina melanoptera melanoptera* (Ruppell)
29.	*Muscicapidae*	285.	*Stachyris pyrrhops* Blyth
30.	,,	286.	*Dumetia hyperythra hyperythra* (Franklin)
31.	,,	289.	**Turdoides malcolmi* (Sykes)
32.	,,	292.	*Garrulax striatus striatus* Vigors
33.	,,	294.	*Garrulax variegatum variegatum* (Vigors)
34.	,,	322.	*Rhiphidura aureola aureola* Lesson
35.	,,	342.	*Prinia socialis stewarti* Blyth
36.	,,	343.	*Prinia sylvatica gangetica*
37.	,,	346.	**Chaetornis striatus* (Jerdon)
38.	,,	352.	*Phylloscopus tytleri* Brooks
39.	,,	355.	*Phylloscopus fuligiventer fuligiventor* (Hodgson)
		Syn. Pt.—IV	
40.	,,	370.	*Seicercus xanthoschistos*
41.	,,	397.	*Cercomela fusca* (Blyth)
42.	,,	399.	*Saxicola leucora* (Blyth)
43.	,,	405.	**Saxicoloides fulicata cambaiensis* (Latham)
44.	,,	410.	*Zoothera wardii* (Blyth)
45.	,,	416.	*Turdus unicolor* Tickell
46.	,,	417.	*Turdus albocinctus* Royle

Sl. No.	Family	Syn. No.	Name
47.	*Paridae*	436.	*Parus melanolophus* Vigors
48.	,,	444.	*Aehithalos niveogularis* (Gould)
49.	*Motacillidae*	466.	*Motacilla maderaspatensis* Gmelin
50.	*Dicaeidae*	468.	*Dicaecum erythrorhynchus erythrorhynchus* (Latham)
51.	*Ploceidae*	484.	*Ploceus megarhynchus* Hume
52.	,,	485.	*Ploceus benghalensis* (Linn.)
53.	*Fringillidae*	499.	**Callacanthis burtoni* (Gould)
54.	,,	508.	*Carpodacus rhodorachis* (Vigors)
55.	,,	517.	*Pyrrhula erythrocephala* Vigors
56.	,,	518.	*Pyrrhula aurantia* Gould

From a major part of the Indian region Ripley (1961) has reported a total of 166 endemic species. Within Dehra Dun and adjacent hills a total of 55 plus 1 doubtful case (*Rhodonessa caryophyllacea*) of endemics occur. So, only 55 endemics (Table 1) are being considered in this study. Of these, there are only 4 endemic genera and are as follows:— *Ophrysia superciliosa* (Gray), *Catreus wallichi* (Hardwicke), *Turdoides malcolmi* (Sykes) and *Chaetornis striatus* (Jerdon). Amongst these the former (*Genus Ophrysia*) can even be considered endemic to the region under study. Because the genus and the species (Mountain Quail) are known from Mussoorie (type locality) and only from three more places. However, the species is considered extinct and nothing on its present status is known.

II. Reported affinities of the endemic species and %

The number of occurring endemic species and respective percentage gives the clear picture of the proportionate zoogeographical affinities of the occurring endemics within the area (Tables 1, 2). The percentage are as follows:— palaearctic 12.6%, mediterranean and palaearctic relicts 1.0%, indochinese 11.4% and ethiopian 6.23%.

P	49, 90*R, 96*R, 119R, 209R, 210R, 252R, 352, 355, 392, 399, 405*?, 410, 416, 417, 436, 466, 499*, 508, 517, 518	Genera 3 Species 22 Relict 7 Relicts ? 1
M & P	346*R ? 405R	Genus 1 Relict 1
IC	88, 91, 97, 148, 153, 162, 192, 197, 207, 215, 217, 245, 249, 267A, 285, 286, 292, 343, 467, 468	Genera 19 Species 20
E	84, 86, 110, 194, 219, 228, 243, 289, 294, 342, 397	Genera 10 Species 11

Table 1:—Giving the species nos. as in Syn. Bhatnagar & Mishra (1971-73) with affinities. Abbreviations:—P, Palaearctic; M & P, Mediterranean & Palaearctic; IC, Indochinese: E, Ethiopian; R, relicts and*, endemic genera & species.

Occurring species and their affinities:—

Palaearctics:—

22 endemics (out of a total of 30 in Indian region) with this affinity occur in the region. These are referable to 9 families comprising 18 genera and 22 species; 7 relicts and 1 relict species with questionable entity. Following species (nos. as in Syn.) representing undermentioned families are reported to occur:—Anatidae 1R; Accipitridae 47; Phasianidae 90,96; Picidae 210; Corvidae 252; Muscicapidae 355 (relict); 399, 410, 416, 417, 436; Paridae 444; Motacillidae 466; fringillidae 499, 508, 517 & 518. Of these following endemic genera and species nos. occur 47, 90, 96, & 499.

Meditterranean & Palaearctic:—

2 endemics with this affinity (out of a total of 4 species) occur. These are referable to 1 family (Muscicapidae) sl. nos. 346 & 405. Both of these are endemic genera too and are of doubtful occurrence in the region.

Indochinese:—

Out of a total of 109, 20 endemic species with this affinity occur in the region. The % bein g 11.4. These endemics are referable to 11 families and are as follows:—Phasianidae

88, 97; Psittacidae 148, 153, 162; Strigidae 172; Captonidae 197. picidae 207; 209, 210; Pittidae 215; Alaudidae 217; Sturnidae 245, 249; Campephagidae 267A; Muscicapidae 285, 286, 292, 294, 322, 343, 370 and Dicaeidae 468.

Ethiopian:—

11 endemics of this affinity occur within the region (out of a total of 30 in the Indian region). These are referable to 8 families and are as follows:—Phasianidae 86; Charadriidae 110; Bucerotidae 194; Alaudidae 219; Artamidae 243; Sturnidae 248; Muscicapidae 289 (endemic genera and species too), 342, 397 and Ploceidae 484 & 485.

Affinity	W		D
1. Palaearctic	30-17 %	...	22-12.6 %
Questionable	2-1 %	...	—
2. Mediterranean & Palaearctic	4-2 %	...	2-1.0 %
Questionable	—	...	—
3. Indochinese	109-62 %	...	20-11.4 %
4. Ethiopian	30-17 %	...	11-6.23 %
Questionable	1-1 %	...	—

Table II. Giving the proportionate zoogeographical affinities of the occurring endemics. W—in the whole of Indian region and D—in Dehra Dun and adjacent hills.

III. Distribution of the endemics within the niches

Distribution pattern of these endemics (Tables 3 and 4) is varied with considerable niche overlapping. It is basically in 5 major distinguishable niches of high hills (HH), lower hills (LH), dense forests (DF), grass lands (GL) and stony river banks (SRB). Due to this overlapped distribution the duplicating nos. that come are as follows:—LH-32, HH-16, DF-5, GL-8 and SRB-4. Palaearctic endemics appear to have wider distribution than the endemics of indochinese affinities in HH. The niche wise distribution percentages of the endemics is as follows:—HH:—P—18.57% against IC—5.70%; LH:—P—10.0% against IC—24.78%; DF:—P—2.85% against IC—4.28%; GL:—P—1.42% against IC—5.71% and SRB:—P—1.42% against IC—nil. Endemics of mediterranean and palaearctic affinities appear to show more eco. distributional preference as they are to be found in the lower and higher hills only (1.42% and 1.42% respectively). However, endemics with ethiopian affinities appear to show more eco. adaptability as they are to be found:—HH—4.41%, LH—14.28%, GL—5.71%, and

SRB—1.42%. Their occurrence as 14.28% in LH of the region significantly indicates the higher eco. adaptability.

Affinity	HH	LH	DF	GL	SRB
P	18.57/54.16	10.0/29.15	2.85/8.33	1.42/4.16	1.42/4.16
IC	5.70/8.33	24.78/35.41	4.28/6.66	5.71/16.66	—
M & P	1.42/50.0	1.42/50.0	—	—	—
E	1.42/5.26	14.28/62.48	5.71/25.0	5.71/25.0	1.42/5.26

Table 4:—Showing % occurrence of the endemics in the niches giving % in relation to total occurring endemics in each niche and % of endemics in relation to total of one affinity viz. in total HH, P is 18.57% while HH in total P is 54.16%.

As shown in Table 5 it appears clear that although there is niche overlapped distribution yet it is usually in related niches. None of the endemics appear to show occurrence in all the niches of the region. This obviously appears to indicate the preference and adaptability of the species.

	HH	LH	DF	GL	SRB
P	47, 96, 352, 410, 416, 417, 436, 444, 466, 499, 517, 518	47, 84, 90, 210, 399, 416, 466	210, 252	84	90
IC	148, 292, 294, 370	88, 97, 148, 153, 162, 172, 197, 207, 215, 217, 245, 249, 285, 286, 322, 370, 408	91, 172 209	88, 217, 267-A, 343	—
MP	405	346	—	—	—
E	194	86, 110, 219, 228, 243, 289, 342, 397, 484, 485	—	86,289, 484, 485	

Table 5;—showing occurrence of endemics in 5 ecological niches in relation to affinities and species (nos. as in *Syn.*).

IV. Discussions

General distribution as evident from total percentage occurrence of the endemics indicates the predominence of the species with palaearctic affinites (12.6%). This is followed by species with indochinese affinities (11.4%); with ethiopian affinity (6.23%); with mediterranean and palaearctic relict affinities (1.0%).

The higher percentage value of the endemics with palaearctic and indochinese affinities appears to be due to zoogeographical nearness of the region. Because even within the Himalayan chains there are pockets affording suitable niches and thus not limiting the zonations of the species. As Mani, M.S. (1968) has referred to the chain as 'refugum' in case of insects there might have been occurring suitable niches even in the earlier periods. Conditions like this might have led to the evoluement of the genera like *Ophrysia*—an entopian endemic within this region. It also leads us to suggest that there might be occurring pockets within this hill chain where we may find other occurring endemics and may find dominence of other endemics too. For this aspect the works of well known ornithologists like Dr. Salim Ali, Dr. B. Biswas on faunistics of the avian fauna in various regions of the Himalayan chain appear to be most significant. Their works also point out that the aspect in other vertebrate group is most lacking and proper linkage could have been derived if the aspect had been dealt by others in their groups too. The hitherto unrecorded penetration of the endemics with ethiopian affinity clearly supports the statement. Their fairly high percentage in various niches appears to indicate their eco. adaptability too. This is contrary to hitherto observed "the ethiopian influence is found in the open dry areas, the western deserts, the dry parts of the Gangetic plains, the deccan plataeu and the dry areas of the peninsula" (Ripley, 1961, p. 24). It also supports the view of Dr. M.S. Mani on insects as supported by Ripley (*op. cit.*)that "the deep penetration of chain of forms of the sub-tropics and tropics upto the high altitudes of 11,000′ in some cases, a phenomenon associated with local micro climates, humidity and the penetration to relatively high altitudes of tropical evergreen forest types. This phenomenon appears to apply equally to avifauna." However, "...the special zoogeographic problems created by the Himalayan chain deserve further interpretation" (Ripley, *op. cit.*). Considering the % value of niche-wise distribution as indicative of the preference or survival factor it appears that these endemics would survive more in the following order of niches: P 54.16% in HH; IC 35.42% in LH; M & P 50.0% in HH and LH; E 62.48% in LH and 25.0% in GL of the region. From the conservation and introduction point of view, the factors lead us to suggest that natural zoogeographic factors as the species in nature adapt be considered for the aspect.

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Winter Track Census of Wildlife of Palamau National Park

CONDUCTED ON 7TH JANUARY, 1973

By

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Deputy Conservator of Forests, Bihar

This winter track sample estimate was conducted on the 7th January, 1973. This was the fourth winter track sample estimate, as the first one was carried on the 4th January, 1970. As the trackers have gained experience, effort was made to employ the same trackers for their respective lines. The Assistant Conservators of Forest also took part in the tracking.

Preparation of the tracks

The boundaries of the five census blocks were not altered and the same number of census blocks were maintained. The track lines are almost equidistant at intervals of about 400 yards. The total number of track lines was 147 as shown below:—

Name of census block.	No. of tracks
1. Betla Block	30
2. Chhipadohar Block	40
3. Harnamar Block	23
4. Mundu Block	28
5. Haratu Block.	26
Total	147

This year the tracks were not cleared and only the ring marks were freshened so that they could easily be visible from a distance. This was done to avoid any bias in the movement of wildlife on the cleared tracks. Shrubs were left as such and no clear track could be noticed. Because of the red rings at breast height on the trees there was no difficulty for the trackers to move along the track. As the shrubs were not cleared visibility was reduced. Even a gaur could not be noticed unless one approached quite close. This also reduced the chance of trackers being noticed by wildlife. These few improvements went to make the track census more bias free.

Each track line was measured and at every ½ km distance along the line, numbers were put to indicate the distance from the starting point.

Condition at the time of survey

It was a sunny day with light whitish clouds lurking on the horizon. There was a light wind. The work of the coupe purchasers was stopped from the 5th January, 1973. It was, unusually, not as severely cold as the previous year. The foliage was darker due to the recent heavy rains in November, 1972 and it had not started turning pale.

Constitution of census party

147 tracks census parties were formed, each consisting of a leader and a follower. Two of the tracks were headed by two Assistant Conservators of Forest. Every effort, was made to put forest subordinates on every line, but this was not possible because of their limited number. The constitution of the estimate pasty was as follows: —

Sl. No.	Name of the Block	Number in the party	Track leaders
1.	Betla	30	30 staff
2.	Chhipadohar	40	12 staff 28 outsiders
3.	Harnamar	23	8 staff 15 outsiders
4.	Mundu	28	26 staff 20 outsiders
5.	Haratu	26	26 staff

Thus of the 147 tracks, 102 tracks were headed by forest staff and the rest by outsiders. Literate villagers, who had previously worked either as leaders or followers were deployed only. Five parties were kept reserved for each Block, so that in case of any emergency, they could be used but it was gratifying to note that no such emergency arose in any of the blocks and every party was in its position at least half of an hour before the appointed time.

The following instructions were issued:—

1. Each party was to consist of a leader and a follower.
2. Parties were supplied with the printed forms to record the number of animals actually seen.
3. Parties were to reach the starting point by 6.30 a.m.
4. They were instructed to note down the distance from the starting point and the time when animals were observed.

5. Entires had to be made whether the animals were seen in isolation or groups, and the category they fell in i.e. male, female, yearling and fawn.

It is to be noted that before the actual census started, the following steps had to be taken:—

(a) All the departmental works and all operations in the forests (throughout the National Park) were stopped from 5th January.

(b) No domesticated cattle were allowed to enter the forest before 11 O'clock on 7th January.

Expenditure incurred

(1)	Freshening of ring marks and cost of paint	Rs. 450.00
(2)	Wages of followers	Rs. 285.00
		Rs. 735.00

Track estimate work:

Tracking was started exactly at 7 a.m. in each block and as per schedule, ended by about 10 a.m. on the 7th January. In the evening of the same day, the entire census papers were collected and the processing of the count was completed by 11 p.m. Each track paper was thoroughly examined and checked to avoid duplication. Consecutive tracks were compared in minute detail and duplications were expunged.

Some interesting examples of duplications are furnished below:—

In Betla Block two elephants were sighted on track No. 24. These elephants were found moving towards track No. 25 through Kanaudhi Nala and the leader of track No. 25 party saw the same two elephants moving towards his track from track No. 24. There was already one elephant on track No. 25 and the two following were of the same herd which were seen by the leader of track No. 24 party. These three elephants were recorded by track No. 25. The two elephants started from one point of Kanaudhi Nala falling on track No. 24, followed the Nala and were seen at the point where the Nala crossed track No. 25. Hence the two elephants recorded on track No. 24 were expunged.

Again on track No. 26, five elephants were observed by the track leaders. These elephants were seen moving towards track No. 27. The track leader of No. 27 party got perturbed due to proximity of the elephants and hurriedly moved ahead. His figures, too, have been expunged.

In Mundu Block on track No. 21 two sambhars, a male and a female, were found running from right to left i.e. towards track No. 22 at a distance of $\frac{1}{3}$ km. from the starting point. The same two sambhars, a male and a female were spotted by the leader of track

No. 22 party on his right about 10 mts. later. Hence the two sambhars of track No. 22 were expunged.

In Haratu Block the party on track No. 4 also sighted one stag and two hinds. These were to their right on a hill. The party on track No. 5 also spotted these sambhars, one stag and two hinds. This was to their left on the same hill. Obviously the same sambhars were seen by both parties. Hence one of the figure (i.e. those of track No. 5) was expunged.

Thus after a careful scrutiny the entire track figures were consolidated to give the track estimate count of the entire National Park.

Name of the Animals		1973 Winter Track census count
Tiger	...	2
Leopard	...	—
Hyena	...	—
Wolf	...	—
Wild dog	...	—
Elephant	...	24
Gaur	...	73
Sambhar	...	160
Blue Bull	...	20
Cheetal	...	623
Barking Deer	...	94
Wild Boar	...	349
Bear	...	3
Peacock	...	151

This being the fourth Winter Track Estimate Count, it is worth while comparing the figures of the past years as detailed below:—

Name of the animals	Year				Remarks
	1970	1971	1972	1973	
Elephant	—	6	17	24	Elephants are occasional visitors to the park. There was a good concentration of them in the Park this year.
Gaur	61	81	53	73	
Sambhar	139	148	125	160	
Blue Bull	7	14	15	20	
Cheetal	597	625	541	623	
Barking Deer	62	95	67	94	
Wild Boar	263	333	251	349	
Bear	2	7	1	3	
Peafowl	123	218	182	151	

Our experience of the past four years goes to show that this method of censussing is not suited to the carnivors. This requires further study to arrive at definite conclusions.

A separate winter census for tigers was carried out in the entire area of this Division and therefore no special emphasis was laid on the estimate of tigers, by this method.

The Miracle of Migration

By

Lt. Col. A.A. David

Migration has baffled human imagination since ages and still remains a mystery. It borders on the miraculous, how these mighty hoards of animals, birds, fishes, insects and even worms in some cases, move season after season, from one place to another and reach their destinations, almost with pin point accuracy.

For the purpose of this article, I am confining myself to the migration of winter birds that visit us, namely the ducks, geese, coots etc. I am also not considering the local migrations which take place at the change of seasons within the confines of country. Ringing, banding and other experiments have shown that the bulk of our winter visitors come from Siberia in Russia, with a sprinkling from Central Asia.

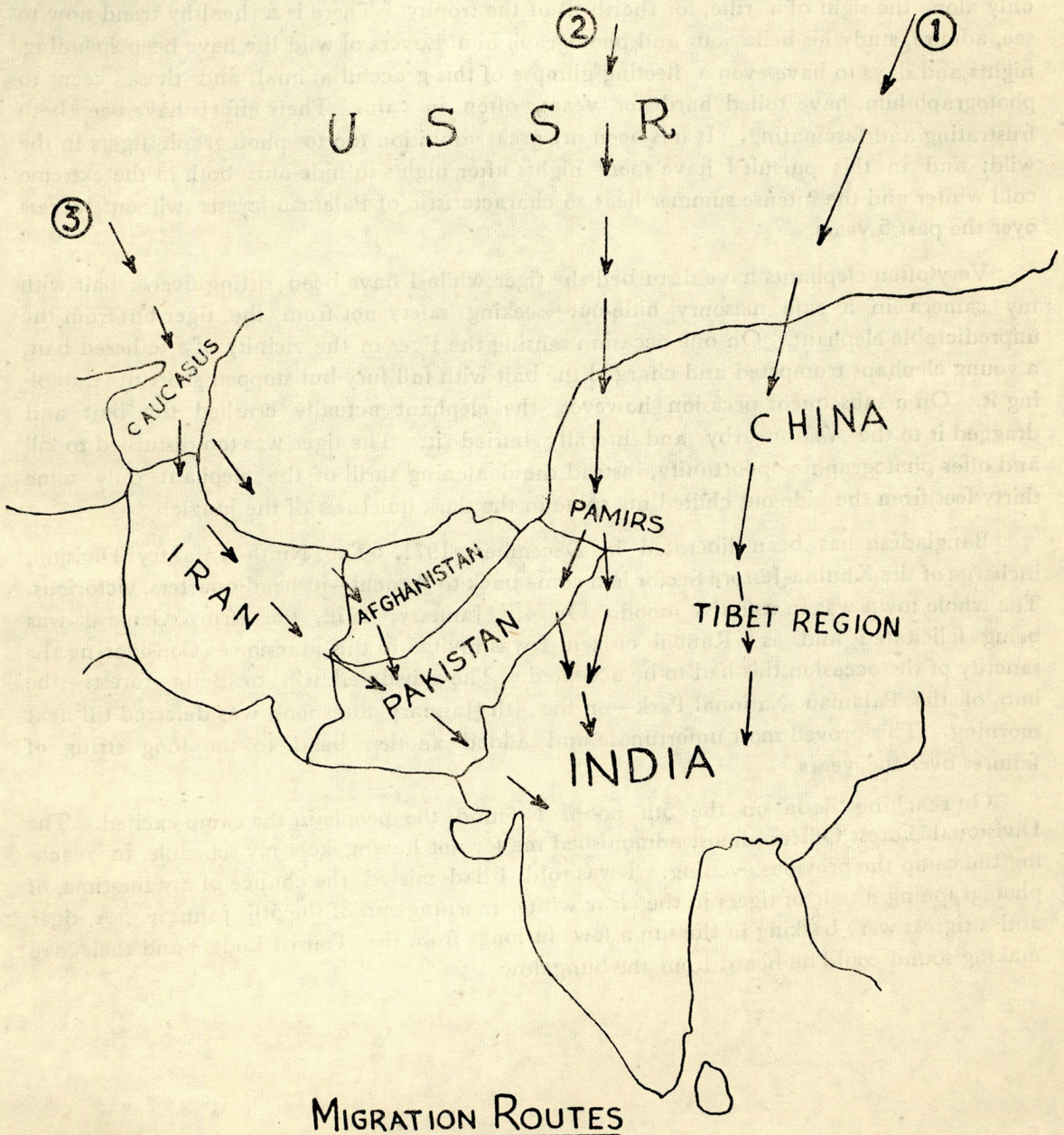
As the first sign of blizards appear in the Taiga swamps of northern Siberia, the home of these waterfowls, a sudden restlessness is observed among the bird population there. Then one day they rise and just disappear, without warning, leaving only stragglers, the sick and the infirm behind. The southward journey is on and this calossal mass travels thousands of miles over different countries and over high mountain ranges and lakes to reach their destination, in the warmer regions. For the junior it is the first trip but for others it may be the second, third, fourth or even the fifth. The flight is not nonstop but is marked with long and short halts, in between. How many of them do not make it is anybodys guess but the bulk of them do.

Now the miracle part lies in the fact that many of these birds are known to visit the same places, the same jheels and even the same localities and water patches. What is that force that guides them to these places with the accuracy of a Sonar beam, is a million dollar question.

There are various theories about the cause of this phenomenon of migration but they remain only theories, without any positive proof. Some say that it is direction of the sun or the magnetism of the earth which is responsible for it and some dull witted shikaries like me, feel that it is natures way of providing food and sport. But the most plausible explaination is that it is the hunger and search for shelter that drives them towards warmer climates, when conditions become inhospitable in their homes. Even hoards of men have been known to move under similar circumstances. But what force or instinct takes them to particular places still remains a mystery. Recent experiments in America have shown a

positive reaction to strong radar pulses by which they have been able to divert the course of migration in some cases.

The winter migration into India gerally follow three routes. (I) Siberia-China-over Tibet-into Eastern India. (2) Russia-over the Pamirs-into Paksitan and North India. (3) Central Asia-Iran, Afghanistan-Pakistan (Sind)-West India. Once in the subcontinent a lot of mixing up takes place and the return journey is not of the same composition. The migrants arrive here by mid September and leave by mid-April.



MIGRATION ROUTES

The Thirsty Tiger

By

S.P. Shahi, I.F.S.

Chief Conservator of Forests, Bihar

Man's attitude to wild life has been changing slowly. The tiger is no longer viewed only along the sight of a rifle, for the thrill of the trophy. There is a healthy trend now to see, admire, study his behaviour and photograph him. Lovers of wild life have been spending nights and days to have even a fleeting glimpse of this graceful animal, and those keen to photograph him, have toiled hard for years, often in vain. Their efforts have been both frustrating and fascinating. It has been my great ambition too to photograph tigers in the wild; and in this pursuit I have spent nights after nights in hide-outs both in the extreme cold winter and the intense summer heat so characteristic of Palamau forests without success over the past 5 years.

Very often elephants have disturbed the tiger while I have been sitting over a bait with my camera in a safe masonry hide-out—seeking safety not from the tiger but from the unpredictable elephant. On one occasion sensing the tiger in the vicinity of a tethered bait, a young elephant trumpeted and charged the bait with full fury but stopped short of trampling it. On a subsequent occasion however, the elephant actually crushed the bait and dragged it to the *Nala* nearby and literally buried it. The tiger was too disturbed to kill and offer photographic opportunity, instead the deafening shrill of the elephant only some thirty feet from the hide-out chilled my spine in the dark quietness of the jungle.

Bangladesh has been liberated in December, 1971. The Ninth Infantry Division, incharge of the Khulna-Jessore Sector had come back to Ranchi—its head-quarters, victorious. The whole town was in a festive mood. On 4th January, 1972, the Army General was being felicitated and as a Ranchi citizen, I was invited to this function. Considering the sanctity of the occasion this had to be accepted. The scheduled trip to Betla forests—the hub of the Palamau National Park—on the 4th January afternoon was deferred till next morning. This proved most unfortunate and added another bead to the long string of failures over the years.

On reaching Betla on the 5th noon, I found the people in the camp excited. The Divisional Forest Officer almost admonished me for not having kept my schedule in reaching the camp the previous evening. I was told, I had missed the chance of my life-time, of photographing a pair of tigers in the clear winter morning sun of the 5th January. A tiger and a tigress were basking in the sun a few furlongs from the Tourist Lodge, and their love making sound could be heard from the bungalow.

A tigress is in estrus some 18 to 20 times in a year. The mating period usually of a week to ten days is marked by intense sexual activity. Bedi records that a pair (Zoo observation) copulated hundred and fifty-eight times in a period of eight days (Cheetal March '71). Copulation is of short duration, half a minute to a minute or so. During mating the female lies on her belly with her four feet firmly on the ground, and the tiger siezes her by the neck before performing. Various love scenes are also enacted. Was the pair seen on the fifth morning enacting the love scenes and mating ? Having arrived late I cannot say anvthing. Bnt what else a tiger and tigress together could be doing ? Tigers (except tigress with cubs) are unsociable beasts and get together only during amatory period. What a chance missed for photographing a pair of tigers in such a situation in the wild, and that too in the best possible light conditions, morning sunny winter.

Reconnaissance of the forests, however, indicated that the tiger and tigress were lurking in the forest round about. Taking an off-chance of seeing him at dusk time we drove into the National Park in a jeep the same evening and as we entered the Park we saw the male standing on the edge of the road. As is the habit of all wild animals, the tiger receded to the forest boundary and crouched some 70 feet away from the jeep, giving me couple of minutes to try a shot with my 200 m.m. lens and flash (Metz 502) synchronised to an Asahi Pentax Camera loaded with Kodak Tri-x (ASA 400).

At dusk with the flash at 70′ distance, no picture was expected even on a fast film like the Tri-x, in forest conditions. Forced development of the negative in Microdol Solution however produced a medium quality negative. Wild life photographs even of poor quality have their evidentiary and morphological value. The markings on the Tiger's face were clear enough in the print for identification.

The 12th June this year worked out to be one of the most momentous days of my forest career. It has been an unusually dry summer all over Bihar and a very severe drought situation has prevailed. Over 500 people according to news paper reports had died of the heat stroke. Palamau even in normal times is very hot and dry in the summer. This year it was worse, water in the forests was restricted to a few natural pools and artificial water holes.

Having arrived at Betla on the 11th evening at 21.00 hrs., I was informsd by the Divisional Forest Officer that the tiger and the tigress had rejoined again. Their pug marks were seen together. A stray horse had been killed the previous evening and had been dragged into the deeper forest as tigers normally do. The carcass had not been eaten till the 11th day-time. We decided not to disturb them in the night. The pair would surely be on its prey feeding. No photograph in any case could be taken without preliminary preparations.

Examination of the kill on the twelfth morning showed that the entire carcass had been eaten away-the clean bony frame and the intestine was all that was left. The pug marks

led to a water hole. A fire-watcher also informed us that he too had seen a tiger in this pool in the evening few days earlier. This was a small natural pool of water in the bend of a forest *nalla* at the foot of a hill, over which a tigress has been known to reside. In an improvised hide-out on the ground some 100 feet away, I fixed my 400 m.m. lens with the Pentax camera loaded with Kodak Tri-x at 17.00 hrs.

I sat facing the water hole in the expectation that if the tiger at all came it would come by dusk round 19 00 hrs. when there would be no natural light. The flash (Metz 502) was fixed at 30 feet from the water hole synchronized with the camera with a 150 feet long cord. For an hour the only activity in which I could engage myself was repeatedly wiping away the sweat from my face in the extreme summer heat of June. My monotony was, however, broken when a troop of Langur (*Presbytis entellus*) monkey, seven in number, came and went to the water hole in two batches of three and four to drink. Although the light was fading by now (18.00 hrs. approximately), photographs could still be taken without the flash. The light meter read 1/60th of a second at f 5.6. Mounted on a firm stand there was no danger of any camera shake at this slow speed. The flash startled the monkeys but did not scare them away. Although the monkeys could be photographed without the flash, I used the flash to find out what reaction the monkeys would have with this artificial light. Among the troop was a very small, possibly a few weeks old, baby monkey greyish in colour and also a yearling white monkey clinging to its mother. Monkeys like tigers have no particular mating season and all age-classes of young ones are seen at different times of the year.

While the second batch of monkeys was drinking, a cheetal doe approached the water hole. I have often found (on this occasion too) that while a batch of monkeys is at a water point, the dominant male or some other male higher up in the hierarchy keeps a watch. The cheetal doe looked at this sentry first and the monkeys at the water next and then being assured that there was no immediate danger, cautiously approached the pool stumping the ground with one of her feet all the time, to quench her thirst.

The principle of co-existence and mutual warning system works efficiently in the forest among the prey animals when a predator is lurking around.

It was all quiet again at 18.20 hrs., the monkeys had unceremoniously left, followed by the cheetal. Only a Drongo dived in the pool, caught hold of a small fish and perched on a tree and started battering its catch, but before doing so, the bird chased a squirrel which went round and round the tree trunk with the Drongo hovering over it, until it ran away into the forest floor for its life. The little common Drongo's ability to chase away birds much larger in size than itself is really remarkable, something like our "Gnats" that kept at bay the big fighter bombers in the 1965 war with Pakistan.

Suddenly a male tiger appeared walking along the path where the troop of monkeys had only a short while ago sat. There was no usual harsh alarm call from monkeys to

indicate tiger's presence. The tiger walked down straight to the water hole. As soon as I got him in the view of my camera, I clicked. This was 18.30 hrs. There was still reasonable amount of light but I used the flash to fill in the extra light; the tiger to my great astonishment unlike the monkeys was not even startled. He walked to the edge of the water hole giving me another opportunity to take a shot at him. The flash this time too did not surprise him—although he was only some forty feet from it. He then entered the water and sat down and remained in the water for full 40 minutes—hardly 30 feet from the flash gun. Only his neck and the head was visible. He had by now seen me and kept on staring at me and the camera throughout. With his golden amber eyes fixed on me he kept on lapping water with intermittent short breaks of a few seconds. The bright rufous red colour of his coat overlaid with shiny black stripes showed that the tiger was in the prime of his life, possibly five to six years old. In the fading light the white patches over the eyes looked the most conspicuous part of his head that seemed to float over the water surface. I took twenty photographs, each time the powerful flash lighted his head. The light had absolutely no effect on him. He did not even look at it. When my film was exhausted I unscrewed the camera and fitted another on the 400 m.m. lens and took another 18 pictures. The mounting and unmounting took some five minutes and caused some noise too but the tiger was just not worried. He had by now satisfied his thrist and raised his head exposing his striped body over the water surface and stared hard at me.

Having exhausted my films and nothing-else to do, my first thought was to sit quietly and keep on watching this magnificent beast as long as he obliged. My temptation to photograph him further when he would leave the pool proved disastrous. The Conservator of Forests whom I had requested to pick me up at 18.30 hrs. had arrived and was sitting in a jeep some 100 yards away from where he could see the flash gun going one after another. My spare film unfortunately, was with him. In my anxiety to get this, I asked the Forest Guard sitting behind me in the hide-out to go quitely and bring it. As the Forest Guard got up; the tiger got up too, and hurriedly left the pool in the direction in which it came, leaving me completely dazed.

Imagine being with a tiger staring at you for full forty minutes, with the flash light falling at quick intervals on his head and the camera clicking only 100 feet away. Had I not provoked him sufficiently with my repeated close flash ?

The tiger has been admired for its stealth, hearing, sight, speed, agility and cunningness. What had happened to some of these attributes ? Had he temporarily lost them in the intense heat ? Having shared a whole horse with his mate the previous night, was he very thirsty ? Or did he feel very secure in the sanctum-sanctorum of Palamau National Park ?

There was no intimidation in his stare and never for a moment any sense of fear gripped me.

The black stripes on the tiger's face had the same pattern of markings as the one seen in January, and there was no doubt that the tiger photographed on two different occasions was one and the same. These markings are as distinctive as human fingerprints.

He is a transient tiger and contrary to the accepted view that a tigress in heat travels in search of a mate, comes to this area to copulate with the resident tigress.

I am lucky to be born in a generation when this most magnificent and graceful animal can still be seen, admired and photographed. Will he survive for our grand children to enjoy his sight in the wild ? He is at present fighting for his survival with his back to the wall.

It was a good augury that the photographs were taken while an I.U.C.N. (International Union for the Conservation of Nature) repreesntative (Dr. Collin Holloway) was preparing a Tiger Project Report to save this World Heritage from extinction, sitting in the Park Tourist Lodge only a mile and a half from this scene.

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Vigil on the 'Machan'

By

Naresh Singh

Director, Park & Sanctuaries, Uttar Pradesh

The big cumulus clouds were rolling in the sky when I reached Corbett National Park at the close of winter, on April 20, 1971. Passing through the Dhangadhi gate, where bougainvillea were at their best, and travelling along a serpentine road through majestic 'Sal' forests, I reached Dhikala, the central place in the Park.

The day's heat and dry winds that I had to endure throughout the road journey had parched my lips, and made me a thirsty man. A chilled Coca-cola gave me some relief. The clouds had started gathering much earlier, and the lightening and thunder in the north-western sky, and little nip in the air brought much relief. The vast savannahs surrounded by hills, the rolling clouds above, the murmuring river and the thunder atop the mountains turned the landscape into a fantasy.

I had visited this beautiful Park many a time, and knew every bit of the ground and had seen the places where the birds sing melodious songs, the pool where the elephants spray their bodies with water, the hill top from where the 'kakar' gives its alarm call, the muddy waters in which the sambhars wallow, and the shady retreat where the tiger lies to spend the hot summer days, and places where the wild flowers fill the surrounding air with intoxicating aroma.

The day came quickly to an end, and the setting sun threw amber light on tree tops. The birds were in their last cresendo of the chorus, and were preparing themselves to settle for the night's rest and sleep. Every bird has its own favourite branch and many species had perched the same tree from one generation to the other, till the green tree was uprooted by the storm or died of age in due course of time. It was now time for the nightjars to awaken and start their 'tonk, tonk' calls.

At dusk the spotted deer and other, who are hunted by the carnivora, alert their ears and noses and depend less upon the sight for their safety from sudden attack. Man is at a great disadvantage in the dark, because his faculties are not so well developed. Therefore in the jungle at night he must seek the safety and comfort of the rest house.

But nights can be very interesting in the wilds of India for those who can interpret the jungle sounds, and with this aim in view, I picked up a few foreign tourists, and sat with them in the open. They had not the least idea that the nights can also reveal the drama that is played in our jungles. They had reconciled themselves to whisky and soda.

The tiger like most predators of India hunts by night, the cat family by stealth and surprise, and the dogs by chasing the quarry. The cats have therefore to take advantage of every available cover to approach the prey unseen, unheard and unsmelt, and charge only then within easy reach. In front of the rest house I was narrating my experiences about the night drama to the tourists, which can not be witnessed but can be heard and interpreted.

We had by now finished the first round of drinks, when the alarm call of the spotted deer was faintly heard. When the call was repeated, we heard it clearly. The carnivora was on the prowl.

A call and two can be made on least suspicion, but when the alarm calls are repeated several times from the same place, it is a clear indication of danger to the deer. These calls were being made by several spotted deer, which clearly meant that they had spotted the carnivora.

The tiger, as it turned out to be was moving from the west end of the grassland and going towards the road junction a few hundred metres behind our camping ground. After a quick dinner we came out again to hear the jungle sounds. Mr. Upadhaya, the Wild Life Warden joined us and told us about the habits and movements of a particular tiger, and he thought that the same tiger was operating in the area the 'Cheetals' were calling. He had on many occasions followed this tiger to study its habits.

In front of our camp flows the Ramganga river, and in the nights the murmur of rushing waters through rapids and pools can be clearly heard. A few elephants were down the river and they were constantly trumpeting and squealing. In the distance a barking deer called intermittently. The spotted deer started calling again, and then suddenly there was pandemonium let loose and several deer called hoarsely. This was clear indication of the tiger's sudden attack upon an unwary creature it had long concentrated upon, and had tracked down with belly to the ground. However the whole drama would reveal itself in the morning by the study of pug marks and other jungle signs.

It was about midnight and the jungle was getting quiet, being time for animals to rest. With heaviness in our eyes and tired to the bone, we retired for the much needed night's sleep.

Before the sun rose above the eastern hills, and while dawn was being heralded by the early birds, I heard several deer calling in the same direction they were calling the night before. The tiger had either not been able to get its meal in the night and was still trying for it, or had got up after the meal, and was retiring to dense cover. The deer had however seen it and were calling to give the last warning before the sun rays drew the curtain over the nights drama of the jungle.

In the direction of the alarm calls there is a water-hole surrounded by dense cover, and near it is built a Machan on a tree fork. There are some shady and cool corners, where animals of many species assemble during summer months, and when thirst compels them, they visit the water-hole. Considering the habits of the tiger, I was sure it was not likely to leave this area after the sun rose, which threw its long rays to warm the landscape. A tiger is a thirsty animal, and after a heavy meal it must have a few drinks during the day.

Here was an opportunity I was waiting for, and I knew that if I spent the whole afternoon on the 'machan' I had a good chance to see the tiger coming to drink at the waterhole. I was very keen to avail this opportunity alone and did not seek any company for fear of disturbing the tiger.

People who know little about the habits and characteristics of tigers very rarely see them. The tiger is a very cunning animal, and has learnt to take the best advantage out of any situation. The hearing and eyesight help it in its daily life and the least sound or movement is immediately detected.

However, things did not go as I wanted, and my lone vigil on the 'Machan' was not destined. A little girl in the camp insisted to accompany me. Her insistence was disturbing because during the hours she was awake, her limbs and tongue never ceased to move. She is a chatterbox that can beat even tne sparrow in the spring time. She possessed both talent and charm, like one coming from Wordsworth's poem, and was also pleasant company. But on the 'Machan' I did not seek the human charm. With little hope to see the tiger, we were on the 'machan' at three in the afternoon.

The tiger is a very sensitive animal, and the one thing that it avoids most is disturbance. Endowed as it is with the keenest sight and hearing, the least movement and sound is not only detected by it, but it can also pinpoint the spot. Probably no other animal has these two faculties developed to this perfection. It was therefore necessary for us to sit like a rock. Dipa made a promise to sit quietly.

It was a hot day that afternoon and all the clouds had disappeared from the sky leaving the land at the mercy of the hot sun. It was uncomfortable to sit on a closed 'machan', when not a leaf stirred. In this heat even the little birds were dozing in shade, and no sounds were heard in the jungle.

Half an hour passed and nothing happened, and it made our vigil uninteresting. Dipa did not possess the patience of a naturalist and told me in whispers, that the whole thing was getting boring. I smiled at her predicament, and without my uttering a word she understood what I meant. She had to bear this torture and sit still till sunset, even if no animals came to the waterhole.

The silence in the jungle was broken by the birds, and there was suddenly an awakening, and many of them started their songs in melodious tunes, a few more not gifted with such voices started their twitter. The paradise flycatcher with its foot long white tail sailed through the branches and was the first to drink in the pool. The emeraled dove, kingfisher, jungle fowl, babblers and a host of other birds came in view. A 'Cheetal' hind cautiously moved through the bush withitstail going up and down. She would stop suddenly, sniff the air, twitch her ears and move again afew steps. She was being followed by other members of the herd consisting of stags, hinds and fawns. There was no hurry on her part to go to the water, as it was necessary to watch for any danger.

The time to drink had started. A little barking deer waiting at the edge came to drink, when the 'cheetals' had departed. After nibbling some grass, it too went the way it came. There was some snorting in the bush on the left, which was faintly heard on the 'machan'. A pair of wild pigs came out from the bush. These ugly looking animals went round the waterhole and making sure that there was nothing to fear, had a drink in the pool. They were hesitating to enter the water to lie down and cool their bodies on that hot afternoon. After looking around they had a quick dip, and suddenly rose and dashed off.

Now things had started happening and we were watching the birds and mammals that were coming one by one. There was a glow on the girl's face. She wanted to speak someting but I signalled her to keep quiet. On the palm of her left hand she wrote the letters—TIGER. I shrugged my shoulders, and in low whispers told her that the time was on. I had not finished my sentence when a 'cheetal' called about a couple of hundred metres from the 'machan'. I gave her final warning and told her to take notice of the alarm calls. The calls were repeated several times till many 'cheetals' called. At long last the carnivora was on the move.

It was the only water source in the area, and I was full of hope that the tiger, if there was one in the area, will be before us in about ten minutes. At such exciting moments the heart starts beating more rapidly. I slowly turned my head and looked at Dipa. She was breathing rapidly and her face became rose red. A few drops of perspiration trickled down her face.

A few bushes were stirred, and I looked up and saw a movement. In the thick cover nothing could be made out till a wild boar with large tusks came out. It was a big boar and looked proud of himself, and the way it moved about showed that it was not afraid in those surroundings. When it lowered its muzzle to drink it too heard the alarm calls. It froze in that position, and after a few moments it turned round to investigate. Suddenly the alarm calls stopped, and the big wild boar started drinking. It then lay down in water.

After a while the boar raised its head and started sniffing the air. It rose quickly and showed some nervousness. The pride gave place to fear and the boar dashed for cover leaving a wet trail behind.

It is often narrated by hunters that a big wild boar possessing large tusks will sometimes face a tiger boldly. In some cases they vouch that under such circumstances the tiger has accepted defeat. How far such stories are correct, I am not competent to comment, but a determined tiger bent upon killing, will hardly spare any animal. I have observed one sambhar stag facing a tiger when its retreat was cut off. With its massive antlers and lowered head, the sambhar aimed the pointed tines to threaten the tiger. A tiger knows that the antlers can do much damage, and under the circumstances will never make a frontal attack. If the tiger does not get a chance to attack from behind or the sides, it may wait till the animal turns round and attempts a stampede.

The pig must have scented danger and decided to leave the waterhole to the owner of the dreaded scent. Pigs have sharp noses.

We were seated on the 'machan' about eighty metres away from the waterhole, and I was using the 300 telephoto lens to photograph the 'cheetals' and pigs. I was changing to 500 mm. telephoto when Dipa pressed my arm.

The waterhole was covered by thick cover from all sides, but there was an opening through which the game-path led to the waterhole. In this opening I saw some movement, and thought another pig was coming. Minute passed minute but nothing came out, till a peafowl came to the waterhole from the other side.

I had told Dipa many jungle stories, and had prepared her in the methods of watching and the study of wild life. She knew that the tiger has keen sense of hearing and sight, and the least sound or movement will be immediately detected by the tiger.

The peafowl suddenly rose and took to wings, and with 'Kek-Kek' alarm calls sailed through the bush. Next instant the last bush stirred, and the head of the tiger came in view. It stood still for a while, scanning on all sides, to see if any unwary animal could be caught, or to make sure all was clear to come out in the open. It suddenly drew back and appeared behind a bush, and lay down.

The tiger seemed to be in no hurry, and on the soft earth it rested with its chin placed on a small mound. It yawned a few times, and when compelled by thirst came out in the open. I was watching it through the view finder and taking pictures. The big telephoto was covering only part of the body, and so I changed to 300 mm. lens again. It was quarter past four that the tiger made its appearance in full majesty. It walked a few paces along the curve of the waterhole and came down to drink. It was lapping water like

a dog, and the only difference being that it sat down on its haunches. It must have been very thirsty the way it was drinking water. Suddenly the tiger looked up towards its right and watched that way intently for a few seconds, then jumped clear of water. Probably there was some noise which disturbed it. After satisfying itself that the noise was made either by a falling twig or by the whirr of laughing thrush wing, it returned to the water. It lapped water a few times and then slowly entered the pool and lay down to cool its body.

The tiger came into India many centuries back and inspite of its living in this country for such a long period, it has not been able to acclimatise itself completely, and is intolerant to scorching heat and summer sun. While the tiger was shaking off the oppressive heat by lying in cool water, the breaking of branches and swish of leaves was heard at some distance. After a while a young elephant tusker appeared on the scene. Both the animals saw each other almost simultaneously and both hesitated to move. Seeing the huge intruder, though not afraid of it, the tiger quickly retreated. It must have been a big relief to the elephant, because on most occasions the tiger would not give way to an animal. The young tusker then occupied the scene, and after filling the trunk with water, it sprayed its body.

In the Indian jungles there is not one dull moment and every minute a drama is played. But the most interesting time comes when the day's tired sun goes down and the red glowing horizon changes into darkness. The landscape which showed many colours now transforms into drabness, and all visibility disappears. It is time when most of the animals wake up from the day's rest and stretch their limbs to start the daily activity. The sambhar stag bellows to notify its territory, and the elephant herds announce their presence at the river with their trumpetings and squeakings. The deer start their alarm calls to warn other folks of the presence of a carnivora. The night's drama in the jungle can be as interesting as watching animals at the waterhole in the day time.

The one principle that is followed in the wilds of India is to live and let live. At this waterhole the powerful and the weak, the black and the brown, the hunter and the hunted, all have a right to quench their thrist and cool their bodies. The bounties of Nature are for every body, and anybody who wants to avail them. The same cool retreat, wherever it may be is occupied by the tiger, deer and pig to ward off the summer heat. The same jungle path will be trod by all animals whenever they wish to use it. This is the jungle law, and not the one that we witnessed in Bangla Desh.

The elephant left the place in search of new pastures and to join the herd. We were now waiting for other animals to appear, and thanked Nature for she opened a few pages of her book 'Jungle lore' when a rustle below the machan disturbed our vigil. I looked down and saw some foreign tourists coming on foot towards the ladder. I narrated the story to them, and left the place to give them the chance of their life time.

———

Communication Among Higher Animals

(Introducing a serial by the noted naturalist)

M. KRISHNAN

I. Senses and perceptions

We are distinguished from other mammals, in spite of so many anatomical, physiological, behaviouristic and even emotional affinities, in many ways. Chief among these distinctions, it has often been pointed out, are the vast development of the human intellect (and with it, the much greater substitution of instincts by reason and intelligence), and the development and everyday use of a highly evolved and intricate language, through which the most profound and complex, as well as the most trivial, ideas and information can be communicated, both orally and through writing.

The cynic may question both these great advances of humanity over the higher animals. In moments of stress and excitement, and in our deepest emotional involvements, we do tend to behave instinctively rather than intelligently—mob hysteria, panic behaviour, deep attachments and sudden antipathies, and sexual behaviour are examples of the dominance of instincts over intelligence in our lives. And as for the much vaunted intellectual advance evidenced by our spoken and written languages, it may be pointed out that an Eskimo and a Hottentot, meeting a Japanese poet and an Oxford don with no interpreters, can only employ a crude and confusing language of signs and gestures in attempted mutual communication. But such an argument is only a side tracking—it only goes to show that though born with a brain immeasurably superior to that of the highest animals, most human skills are acquired and not inherited, specially our skills in communication.

It is more rewarding to realise that in spite of the immense development of our languages, with all their nuances and precision of expression, we often use gestures and signs as adventitious aids or substitutes for speech, specially under excitement, as when we beckon someone to come in addition to calling him urgently, or shake a fist in anger when uttering threats.

In all studies of animal communication, the axiom is widely recognised that the very development of an organ to express or receive some communication presupposes the existence of communication through that medium. The fact that a bird has a song argues the ability of other birds of its kind to hear the song, and the presence of well developed visual organs argues the ability to see things. This truth which is self evident, is more complex than it may appear at first sight. For example, because we know that an animal possesses acute vision, hearing and smell, we are apt to presume that its ability to communicate or to receive communications is limited to these senses in a given situation, which might be quite

misleading, and worse still, to interpret its powers of vision, hearing and smell in terms with which we are most familiar, our own experience of these senses.

Senses familiar to us, sight, hearing, smell, taste and tactile perceptions, are also possessed by most animals, but their apprehension through the medium of these senses may be very different from ours and the dominance of these senses in their lives is often notably different from the sensual dominance values obtaining in our largely audiovisually governed lives; moreover, they may possess perceptions unknown to us. All this, I realise, sounds like a lot of words, but a few examples will make things clear.

Male moths are able to sense the presence of a female moth from over a mile away, not through perception as known to us but through their intricate and delicate antennae and the smell given out by the female; among reptiles, the tongue acts as a conveyor of scent perception to a Jacobsons organ located in the roof of the mouth (this organ consists of highly scent-perceptive pits)—the tongue is flicked out and then retracted in to the mouth and conveys scent particles to this organ, and is in this manner, an indirect scent perception of the environment and the proximity of the prey is effected; among some snakes there are special heat sensitive organs which are able to detect delicate thermal variations. There are many other examples among animals of such specialised sensory perceptions through organs unknown to the higher mammals.

Even among the higher mammals, endowed with sensory organs similar to ours, the acuity and delicacy of perception may be superior to ours, or may be of a different order altogether. It is not that these animals are superior to men in all their sense perceptions, but that often their perceptions are of a different kind or degree. A brief comparison of the main senses of men and the higher animals will be useful at this stage.

Human vision is acute, colour sensitive, and being binocular is well able to appreciate depth in perspective and to distinguish stationary objects; the angle of field of our eyes is limited to about 25°, but the head can be turned quickly in any desired direction to widen this angle—as it also can be, by most animals. Many animals have eyes at the side of an elongated deep face (as distinct from our flattened face), so that they can have binocular vision only when looking at things right in front of them but are as well able to see things on either side with their laterally located eyes, though their lateral vision is necessarily flattened in depth, because it is seen through each eye independently of the other. Cattle, deer, antelopes, and most rodents are examples of such animals; in hares, the eyes are placed so high on either side of the head that they can even see what is slightly behind them. Many forest living animals have poorer vision than we have, elephants and gaur, for instance, but vision is still important to them. Moreover most of the mammals lack our ability to see colours—they are colour blind and reds and greens and blues appear to them as shades of grey, much as they to panchromatic black and white photographic

Gaur cow licking calf to recall it from the proximity of a riding elephant and men.
Photo by M. Krishnan

Pariyar Lake:

Moulting Darter: one bird seen on only one dry tree trunk out of 500+, emerging over the lake surface in a small sample area. The dry trees are said to be increasing the beauty of the lake. One wonders how? Those that are seen, form route-tracers: For those that are not seen (submerged) form serious navigational hazzards. Free use of the lake for yatching is restricted; sale of bio-aesthetics is thus limited.

Transition habitat system, aquatic form: rains and winter communities. Bharatpur Sanctuary, Rajasthan. The same area changes to terrestrial form in summer: lots of grass, good grazing and plenty of dung to renew the nutrients for the next cycle of aquatic form.

Photos by—S.R.Chaudhuri

emulsions. The phrase "the red rag to a bull" is purely symbolic, and has no literal truth in it, since cattle are colour blind. Some animals, such as monkeys, blackbuck, and the greater cats, have acute vision. At night when light levels are so low that we do not refer to the existing light as 'light' but only as 'darkness' even our colour sensitive eyes are unable to see colours distinctly—even by bright moon light, we cannot judge colours surely. Nocturnal animals are able to see much better than we can by such dim, low levels of light—the greater and even the lesser cats, lorises and some kinds of deer are examples of mammals with specially good night vision. Of course, no animal can see anything in total darkness.

Our powers of hearing are good and our vocal capacity unrivalled: no animal can produce so many distinct, articulate sounds or indulge in such sustained vocalisation. However, many mammals have a greater acuity, or a greater range, of audition. Most animals of the cat family can pinpoint sounds with an accuracy beyond our powers, and dogs can hear sounds pitched too high to reach the human ear. As everyone knows, snakes have no organs for hearing airborne sounds, but are sensitive to ground vibrations—among aquatic animals, notably the Dolphins, the ability to apprehend high frequency vocalisations and vibrations through the water has been established. Some bats have a marvellous radar system to guide their flight; they emit high frequency squeaks which are reflected back to their ears the objects in their line of flight.

All sounds produced by animals are not vocal. Many animals (cheetal and sambhar are examples of such animals) when alarmed and uneasy stamp their fore feet on the ground, as a signal of alarm short of flight. Elephants produce a metallic thud by rapping the incurved tips of their trunks sharply on the ground, when alarmed or in doubt—the sudden impact, vibrating the column of air inside the trunk, produces the sound. Even we produce such nonvocal sounds on occasion, applause being probably the best example.

Smell, little developed and mainly in association with the sense of taste in us, is one of the most important senses of most mammals, and the dominant perception of some. Dhole and wolves follow their quarry by ground scent, and most gregarious animals, such as elephants and deer, are also able to follow trails by ground scent—this is something of which we have no personal experience whatever. The extraordinary powers of detecting the presence of predators and intruders through airborne scents possessed by many animals (such as deer, gaur and elephants) are also unknown to us. A hunting dog can scent a pig a mile away, wind being right, or a herd of deer a hunter. Some animals which have exquisite noses appear to be near scented; a sloth bear or a pangolin can detect subterranean prey surely, but both appear to be near scented.

Smell plays an important part in the breeding of most mammals and also in the identification of individuals. A mother and her infant are able to identify each other by

body scent in a diversity of mammals. A dog can instantly spot its master by body scent in darkness—even a blind dog can—and the utilisation of police dogs to track criminals depends entirely on the ability of the dogs to identify individual scents.

Tactile communications are not entirely unknown to us. We feel our way about when, for any reason, sight cannot clearly guide us, and in drawing the attention of another quietly to something, we touch that other lightly. However, tactile perceptions are developed to a much higher degree among many animals. It is well known that any cat can go where its whiskers can, and these thick sensitive hairs are specially characteristic of the cat family—other predators too have well developed vibrissae, otters, for instance. Touch serves an important function in the intra-specific gregariousness of most animals—they huddle together at times, and apparently find a measure of reassurance in their close togetherness. The tongue is mainly an organ of taste and sound production in us, and is highly proficient in both ways. Licking as a means of cleaning, surface stimulation and social intimacy, is an important use to which many animals put their tongue. Cats lick their coats all over with their rasping cleaning tongues, and so do many herbivores. Among most mammals, the infant young are assiduously licked, and on occasion even the adults. Among herbivores, the mother licks her young soon after giving birth to it with long, strong and steady strokes of her tongue; no doubt this stimulates surface circulation, acting as a massage, a lingual massage, and helps it to rise to its feet; licking is also used to direct the infant to suckle. On occasion it is also used as a compulsive direction to the young to follow its mother, when no other direction will serve. An infant gaur calf once left its herd and mother and came bounding up towards the riding elephant on which I was seated, apparently the great beast, which it had never seen before, fascinated the calf. The mother calf tried mooing softly to her calf, to attract it back to her, and when this urgent summons failed and the calf came still nearer to the elephant, she walked up to it and licked it strongly and then turned and walked back to the herd, when the calf followed her. Incidentally, the elephant, an adult tusker, was positively nervous at the gambolling approach of the little calf, and kept shifting his feet and blowing spittle at the calf from his trunk to drive it away.

The fascinating question of extra sensory perception has exercised the minds from time immemorial. It has been asserted by many hunters on occasion their quarry seemed to possess a 'sixth sense'—while the hunters have themselves have sometimes claimed this mysterious faculty that had warned them in the nick of time, when they were not aware of any danger sensed through their normal perceptions. I shall say nothing of this 'sixth sense' or E.S.P. here, but sometimes animals do behave in a rather queer way, as if they had means of communication (most probably through recognised channels of their normal senses) that we do not know of. For instance, a herd of elephants grazing in the open will,

at times, suddenly congregate in a tight circle, heads to the centre and tails to the periphery, and seem to spend a few minutes in a silent conference, where except for small movements of the trunks and ears there is no overt gesticulation or attitudinal communication, then the herd (party) turns silently round, as if at a pre-arranged signal, and moves away purposefully in a definite direction (see cover photo). I do not know what communication is effected at these silent conferences or how there is any communication, but have often observed this phenomenon. The truth is that it is very difficult to know the truth in such matters, without having the miraculous power that we have lost since the days of Vikramaditya to transform oneself temporarily into an animal.

(Continued)

(By kind courtsy—Editor, I.T.I. Magazine).

The Wild Life (Protection) Act 1972

SCHEDULE V

LIST OF VERMIN

1. Common Crow, 2. Common Fox, 3. Fruit Bats, 4. Jackal,
5. Mice, 6. Rats, 7. Voles.

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Vote accordingly
CLEAN UP A PARK
Create a Park
Plant a tree
Plant a thought
Join a group
Listen to kids
Talk to friends
Make a speech
Read a book
Learn the facts
Write the editor
Think first
LOVE thy country
Don't leave it, fix it up
Take a picture
Show it to somebody
Don't wear Wild Furs
Boycott crocodile products
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Complain to Wild Life Warden
Get right with nature
Change some Laws
Think what might be
Ask why not
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Feel the bark
Watch a bird
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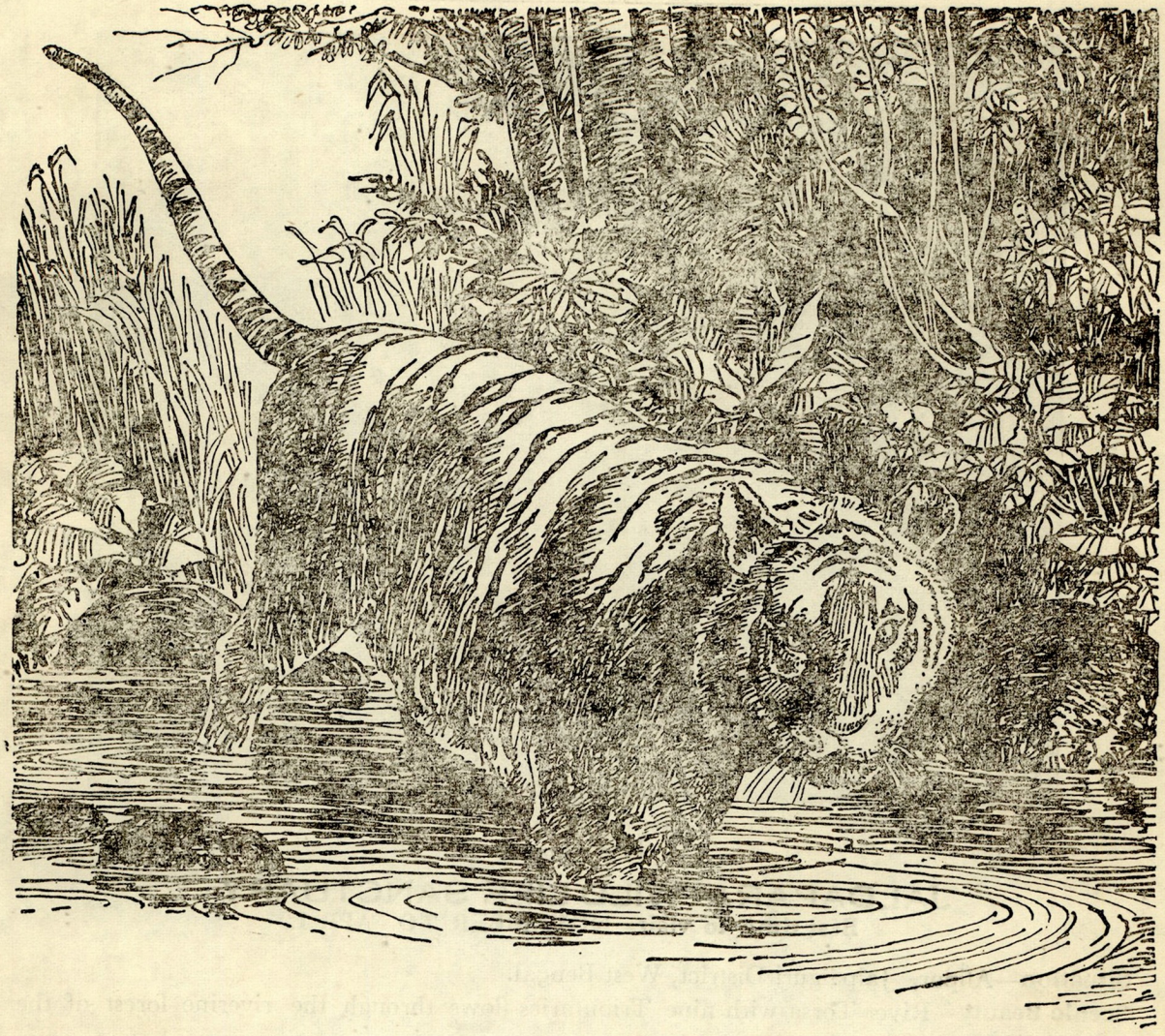

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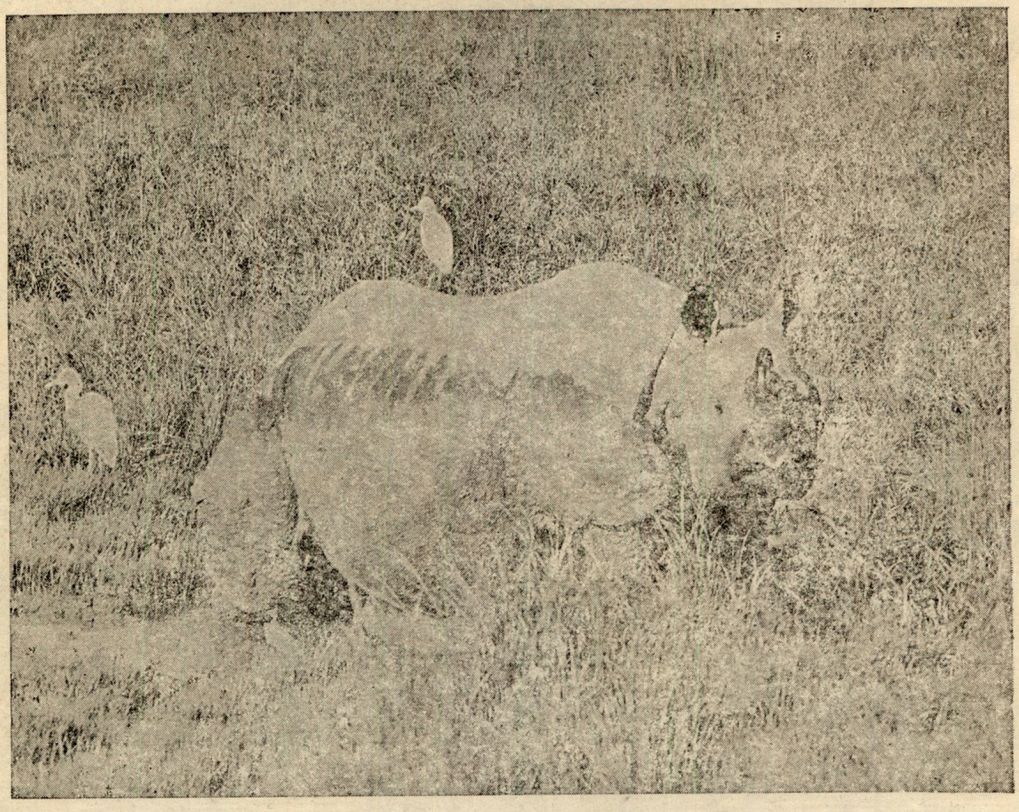

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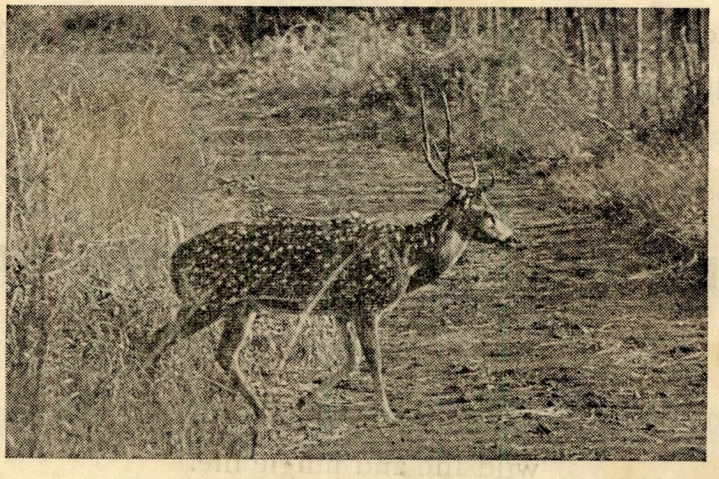

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Tourism is the world's biggest industry...

... and the fastest growing!

Tourism is a Rs. 11,000 crore world business today. Roughly twice the size of the oil industry. In five years, it will be worth Rs. 18,000 crores! An almost 75% increase.

Investment in tourism earns the most foreign exchange in the shortest time. For instance, Yugoslavia invested Rs. 38 3 crores in tourism in 1968 and earned Rs. 140.3 crores. A net profit of 250%! And Spain could build two steel plants like Bhilai each year on her tourism earnings alone!

What about India?

The number of visitors to India has increased. From 150,000 in 1964 to almost 245,000 in 1969. And our earnings from tourism have gone up to Rs. 33 crores in foreign exchange.

But in terms of world tourism, India got only one out of every thousand world travellers last year. Yet we have just about everything to make India the world's most attractive tourist destination.

What's missing here?

Nothing but broad-based public participation. And enough of what is known as the 'infrastructure': hotel accommodation, transport facilities and tourist amenities. For instance, the city of Bangkok alone has more hotel beds suitable for tourists than the whole of India!

And when the Jumbo jets come, bringing many thousand more visitors our way, we shall need all these amenities in far greater measure.

What are we doing about it?

The Government is actively involved in the building of new hotels, improving air and transport services, providing new and better tourist facilities.

But that is not enough. Because Tourism is everybody's business. It involves people at every level all over the country. So join us in our efforts. Let us give the tourist the amenities he needs and see that he goes home happy. Each happy tourist means so many more will come next year. Shouldn't be too difficult for us. Isn't ours one of the world's oldest traditions in hospitality?

ASP/TC/T/1914

Department of Tourism
Government of India